

POPULAR SCIENCE

MONTHLY



JULY
25¢

*American Destroyers Help
Smash Japan . . Page 128.*

*How the Gyroscope Stopped
Jap Suicide Pilots. Page 86.*

11 MONTHS IN A NAZI PRISON CAMP—PG. 65

AT
LAST!

All the Sciences

10,000 Subjects

1235 Pages

HERE is the most complete book on science and its practical applications ever published. It is impossible, without seeing this great book for yourself, to get any true idea of its impressive size and its remarkably complete coverage of technical knowledge. Principles are clearly explained. Facts, formulas, tables, and data are complete. Methods of calculation are fully described.

This vast fund of information has been prepared and organized by a plan that insures its usefulness and accuracy. Each entry is first explained in simple, broad terms that are easy to understand and which clarify the detailed and more advanced information which follows. The great number of charts, photographs, and diagrams have been specially selected to make this book valuable as a reference even in fields that are entirely new to the reader.

More Than 10,000 Scientific Terms Arranged Alphabetically

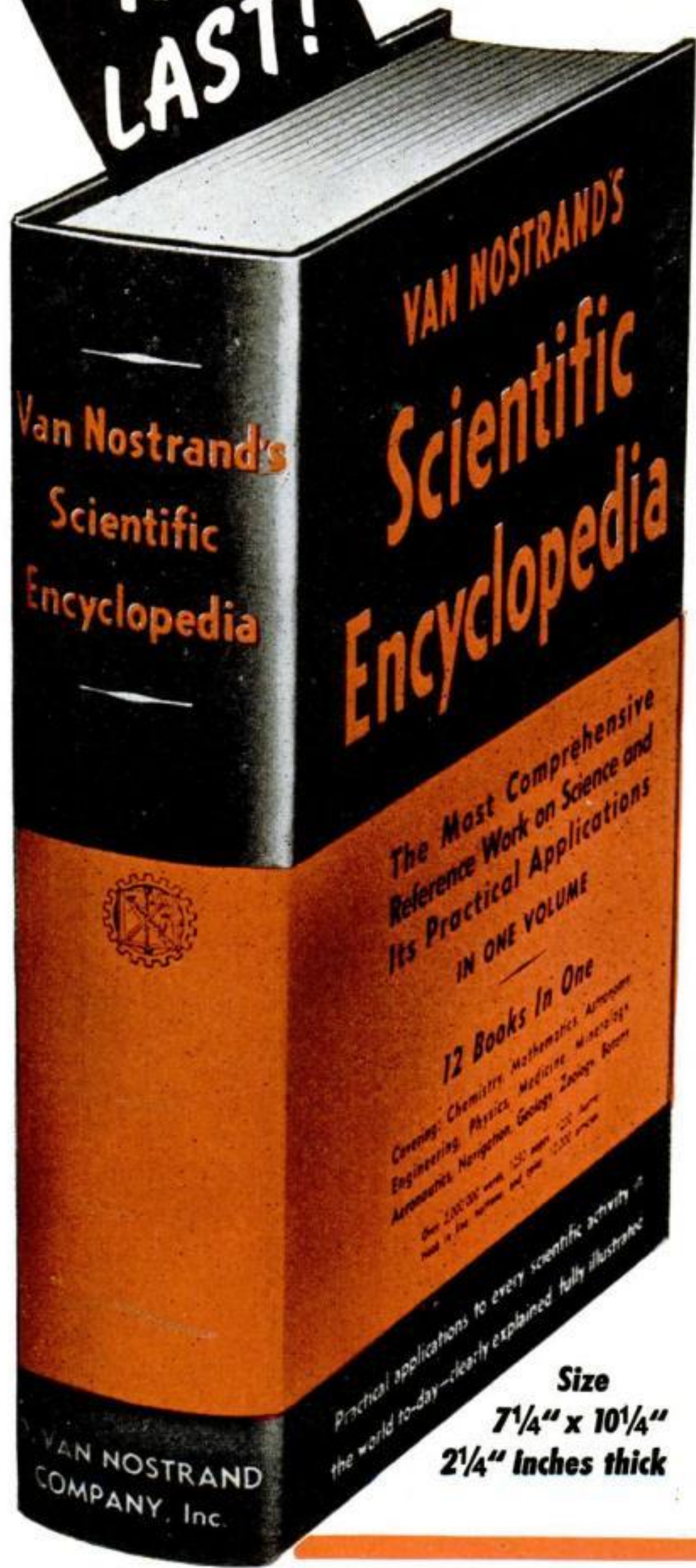
For the student, the hobbyist, the mechanic—for everyone who owns a home workbench or who likes to work with his hands—this great volume supplies, for the first time, *a single complete source of reference covering all the sciences*. In fact, the ample cross-references make it easy to follow a complete course of study on any chosen subject. For the professional scientist, the alphabetical arrangement of subject matter enables him to find specific information instantly, comprehensively treated, and in the language he works with—the language of science.

Answers Thousands of Questions

Condensed within the pages of this great reference work, and so arranged that they are always at your fingertips, are the answers to thousands of scientific questions—questions such as:

How rayon is made. What is the coming television system? How to survey a tract of land. How an airplane-beacon system works. How petroleum is cracked to make gasoline. How air conditioning functions. How to find your position at sea. How to do dead-reckoning. How a diesel engine operates. What is the principle of the storage battery. How optical instruments are constructed. How your nervous system works—and thousands more.

MAIL COUPON ON OPPOSITE PAGE



VAN NOSTRAND'S
**Scientific
Encyclopedia**

The Most Comprehensive
Reference Work on Science and
Its Practical Applications
IN ONE VOLUME

12 Books In One

Covering: Chemistry, Mathematics, Astronomy,
Engineering, Physics, Medicine, Mineralogy,
Aeronautics, Navigation, Geology, Zoology, Botany

Over 2,000,000 words, 1,200 pages, 1200
illustrations, and more

Practical applications to every scientific activity in
the world to-day—clearly explained, fully illustrated

Size

7 $\frac{1}{4}$ " x 10 $\frac{1}{4}$ "

2 $\frac{1}{4}$ " Inches thick

VAN NOSTRAND
COMPANY, Inc.

This One



UFKH-HNC-U5DZ

in One Great Book

Twelve Big Volumes in One

A COMPLETE SCIENTIFIC "LIBRARY" IN ONE BIG VOLUME—

The tremendous wealth of information in Van Nostrand's Scientific Encyclopedia, if published in the ordinary way, would fill more than twelve average-size volumes. Here is but a brief outline of some of the subjects covered:

MECHANICAL ENGINEERING: Principles of mechanics, blueprints, machine design, engineering instruments. Automobiles, airplanes, locomotives. Steam, gas, Diesel engines.

CIVIL ENGINEERING: Surveying. Bridges, highways, railways—every subject thoroughly explained.

ELECTRICAL ENGINEERING: Motors, generators, lighting, radio, television — fully covered, clearly illustrated.

CHEMISTRY: Elements — symbols, atomic weights, density, hardness, etc., occurrence in nature, method of production, manufacture and use. Compounds — full information, including manufacture and use. Organic compounds — fully covered. Industrial products. Agricultural chemistry. Food chemistry.

PHYSICS: Energy, heat, light, sound, motion, power. Mechanics, electricity, X-rays — principles and applications.

MATHEMATICS: From fundamentals of arithmetic through algebra, geometry, trigonometry, and calculus; with special emphasis on practical application.

ASTRONOMY: Articles, charts, and photographs covering the entire subject. Star map locates all important constellations.

ZOOLOGY: The whole story of life from the tiniest single-cell organisms up to man himself.

MEDICINE: Anatomy, circulatory system, nervous system, muscular system, skeletal system, excretory system. Vitamins, hormones. Bacteriology. Drugs. Diseases, symptoms, diagnosis, treatments.

The foregoing is only a partial list of the countless special subjects covered. You will find hundreds of articles on GEOLOGY, BOTANY, NAVIGATION, CHEMICAL ENGINEERING, and, in fact, any special branch of science in which you want information.

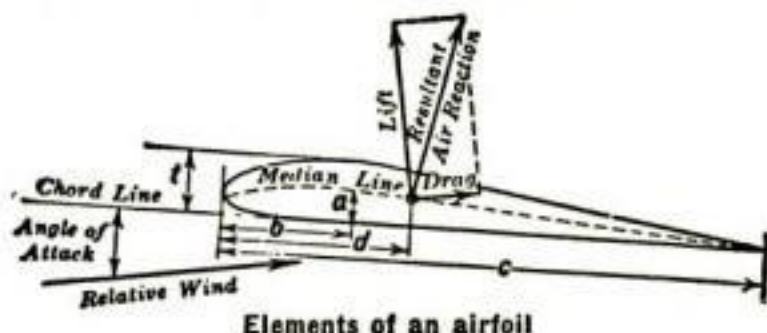
EXAMINE A COPY FREE

It is difficult in this limited space to give you an adequate idea of the immense amount of material contained in the Van Nostrand Scientific Encyclopedia. See this volume for yourself, without expense or obligation. We will send it to you for free examination.

Prepared by Outstanding Authorities in Each Field of Science

The high technical standing of the editors is your assurance of the authoritativeness and the accuracy of every statement.

1200 ILLUSTRATIONS AND DIAGRAMS



Section through power cylinder — Worthington Diesel Engine.



Furnace for sublimation of sulfur.

CONTRIBUTING EDITORS

Richard M. Field, Ph. D.—Princeton University
Warren K. Green, Ph. D.—Amherst College
Arthur W. Lindsey, Ph. D.—Denison University
Frederick T. Morse, M. E., E. E.—University of Virginia
R. S. Mueller, M. D.—Columbia University
Lloyd L. Small, Ph. D.—Lehigh University
Edward S. C. Smith, S. B., A. M.—Union College
Ralph K. Strong, Ph. D.—Rose Polytechnic Institute
LeRoy D. Weld, Ph. D.—Coe College
R. M. Whelden, Ph. D.—Massachusetts Institute of Technology.

Among the many CONSULTING EDITORS

ROBERT H. BAKER, Ph.D., D.Sc. University of Illinois
HEMPSTEAD CASTLE, Ph.D. Yale University
C. W. CUNNINGHAM, B.S. College of the City of New York
HERBERT O. ELFTMAN, Ph.D. Columbia University
ERICH HAUSMAN, E.E., Sc.D. Polytechnic Inst. of Brooklyn
ADOLF KNOPF, Ph.D. Yale University
JOHN C. RATHBUN, Ph.D. College of the City of New York
EDGAR P. SLACK, S.B. Polytechnic Institute of Brooklyn
HUGH S. TAYLOR, D.Sc., F.R.S. Princeton University
JOHN TURKEVICH, Ph.D. Princeton University
VOLNEY H. WELLS, Ph.D. Williams College

MAIL THIS COUPON

D. VAN NOSTRAND CO., Inc., 250 4th Ave., New York 3, N. Y.

Send me Van Nostrand's SCIENTIFIC ENCYCLOPEDIA, complete in one volume, 1,227 pages, bound in sturdy Fabrikoid. Within 10 days I will either return it or send you \$2.00 as first payment, and \$2.00 monthly for four months until the total price of \$10.00 plus a few cents postage is paid. (If you send remittance of \$10.00 with this coupon, we will pay the postage. Same return privilege with refund guaranteed.)

P. S. M. 7-45

Name

Address

City

Reference

Address



"Son says they'll be home for dinner"

That hundred-mile trip to the city used to take a good part of the day not so long ago. But it's only a little over an hour now—flying a 'Craft.

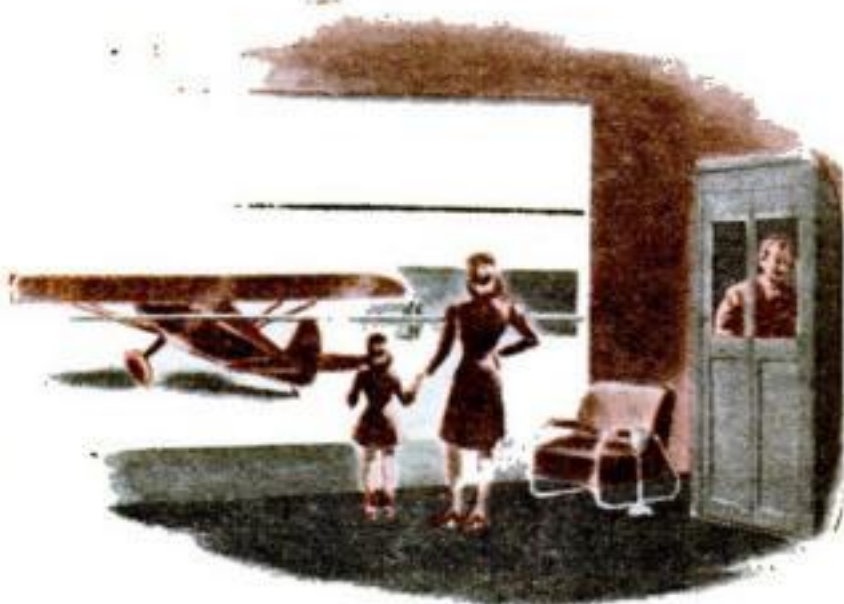
Yes, and it takes even less gas to get there than the old "Model T" did—just about 4 gallons.

Some day not long from now *you'll* be able to fly a new 'Craft. Then you'll begin to realize what *modern* transportation really is.

We've already built flying models of planes that will outperform anything in their class . . . faster-flying, more luxurious, finer in every way . . . planes that are safer because of greater built-in stability . . . planes that cost less to buy and less to fly.

In a word, the plane *you* have been waiting for—whether you're a private pilot—or Mr. Average Citizen who's never flown a plane before—or an aircraft service operator who knows a good thing when he sees it.

Watch "the ship with the built-in tailwind" outperform in '45.

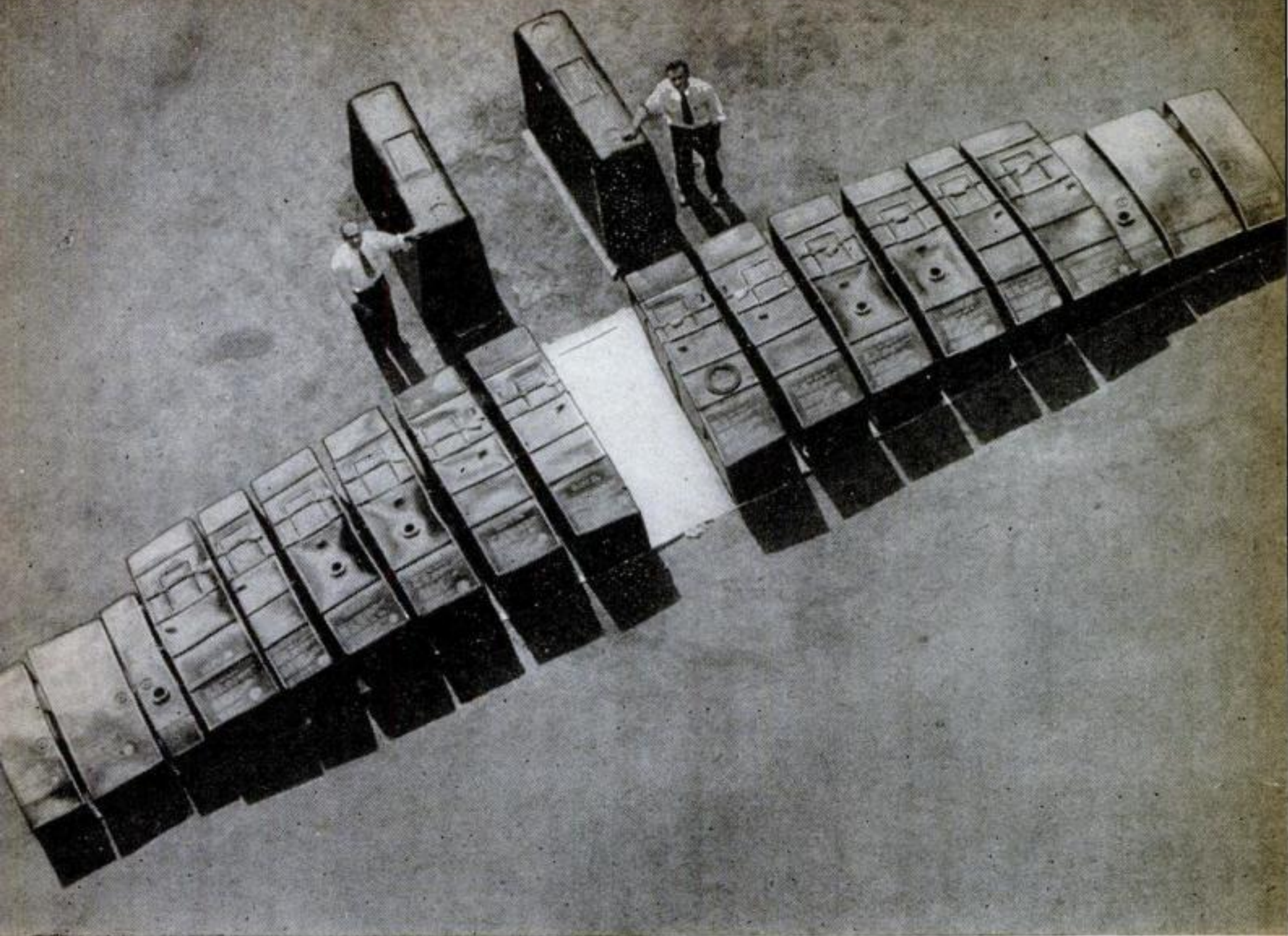


Taylorcraft

World's Largest Builders of Side-by-Side Airplanes

TAYLORCRAFT AVIATION CORPORATION • ALLIANCE, OHIO

Popular Science Monthly for July, 1945, Volume 147, Number 1, Published monthly at 353 Fourth Avenue, New York 10, N. Y. by Popular Science Publishing Co., Inc. Entered as second class matter Dec. 28, 1918, at the Post Office at New York under the act of March 3, 1879, additional entry as second-class matter at Dayton, Ohio. Yearly subscriptions to the United States, \$2.50.



Airplanes carry gasoline in rubber suitcases

WHEN the crew chief of a Consolidated "Liberator" says, "Fill 'er up," here's what they fill. These gas tanks are arranged exactly as in the plane's wings. They look like this because they were designed to "eat" bullets and get away with it.

B. F. Goodrich makes them to seal so fast only a few drops of gasoline can leak out! They can take .50 calibre machine gun slugs, incendiaries, even small cannon fire, without exploding.

The tank wall is the secret. It's sort of a triple-decker sandwich of synthetic rubbers and fabric. Some of these layers are resilient enough to be pushed *aside* rather than *out* when a bullet goes through. They spring back in place after it's past.

Any hole still left at this point is sealed by the very act of gasoline starting to leak through. For one of the special layers (called the sealant) swells when gasoline touches it, and this instantly closes the puncture.

B. F. Goodrich engineers pioneered many of the developments that led to today's life-saving bullet-sealing fuel tanks. They make oil tanks that seal the same way... gasoline hose, too. Intimate knowledge of synthetic rubbers made all these possible.

Many other B. F. Goodrich aircraft products reflect unusual synthetic rubber experience. Among them molded engine parts that resist oil and stand up under extremes of heat and cold;

expander tubes for brakes that stop planes efficiently in the Arctic or the tropics; even the largest airplane tires are now made principally of synthetic rubber.

They're part of a family of more than 80 rubber parts that carry the name B. F. Goodrich wherever rubber flies. The B. F. Goodrich Company, Aeronautical Division, Akron, Ohio.

Skyway or Highway

B.F. Goodrich

FIRST IN RUBBER

ONE-MAN BOMBERS

Lockheed P-38 Lightnings — powered by Allison engines and originally designed as fighter planes — are now being used also as one-man bombers against the Japs. ★ When the two bombs — one ton under each wing — are released, the Lightnings continue in combat as fighters — a dual attainment

made possible by the engines' extremely light weight, less than one pound per horsepower,* which gives the plane superlative lifting power as well as speed.

★ This extreme light weight — long the dream of engineers the world over — is a product of Allison precision and skill in handling metals — a precision and skill which will mark any product ever bearing the Allison name.

KEEP AMERICA STRONG
BUY MORE WAR BONDS

POWERED BY ALLISON

P-38—Lightning
P-39—Airacobra
P-40—Warhawk
A-36 and P-51A—Mustang
P-63—Kingcobra

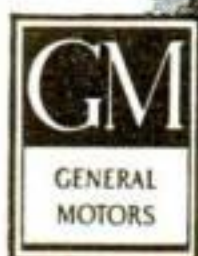
*Actual weight of Allison engine is $\frac{7}{8}$ lb. per hp. Allison was first engine of less than one lb. per hp.

LIQUID-COOLED AIRCRAFT ENGINES

Allison

DIVISION OF

Indianapolis, Indiana



Every Sunday Afternoon—
GENERAL MOTORS SYMPHONY OF THE AIR—NBC Network

DUPLICATING A GERMAN VACUUM TUBE IN 3 DAYS

Just behind the battlefield, a telephone system lay dead. The retreating enemy, hoping to return, had not blown it up, but had taken with them its vacuum tubes. To put it back to work, the General ordered 1000 new tubes — spot delivery.

A sample tube was flown back to the United States and brought to Bell Telephone Laboratories. It was of German design, different from any American tube in both dimensions and characteristics. Could it be duplicated soon? The job looked feasible. Within three days, try-out models were on their way to Europe. Three weeks later, Western Electric Company had made and delivered every tube. They were plugged in; vital communications sprang to life.

Vacuum tubes are an old story for Bell Laboratories scientists. Back in 1912 they made the first effective high vacuum tube. Three years later, they demonstrated the practical possibilities of tubes by making the first radio talk across the Atlantic, pointing the way to radio broadcasting. Since then, they have developed and utilized the vacuum tube wherever it promises better telephone communication — there are more than a million in your Bell Telephone System.

Today, Bell Telephone Laboratories is solving many of the toughest tube problems faced by the Armed Forces. When the war is over, it goes back to its regular job — keeping American telephone service the best in the world.



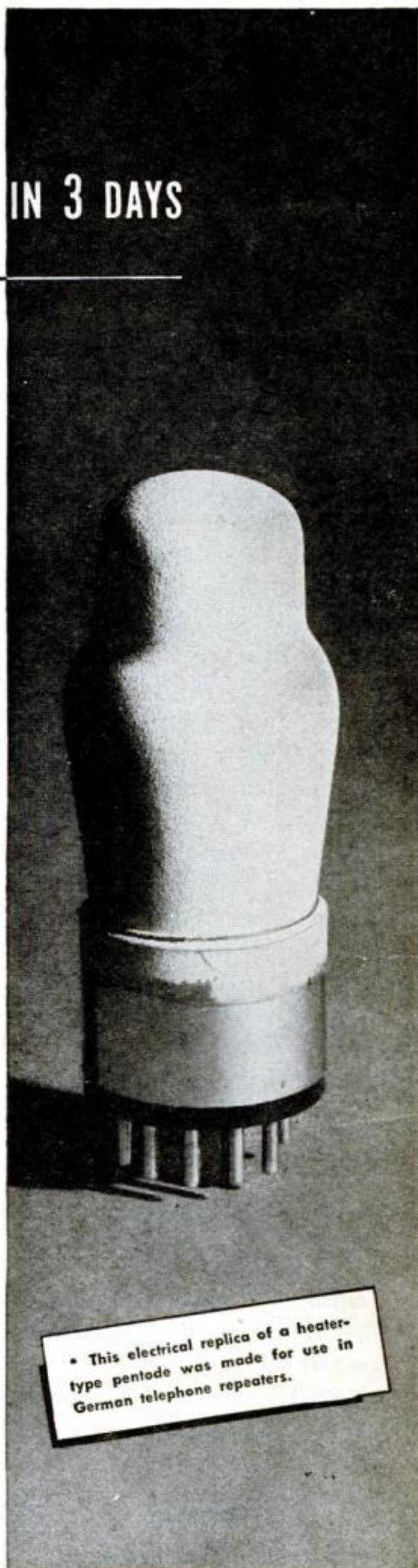
BELL TELEPHONE LABORATORIES

Exploring and inventing, devising and perfecting for our Armed Forces at war, and for continued improvements and economies in telephone service.

JULY, 1945

Buy War Savings Bonds and Stamps regularly.

5



• This electrical replica of a heater-type pentode was made for use in German telephone repeaters.

POPULAR SCIENCE

FOUNDED 1872

MONTHLY

VOL. 147 NO. 1

Mechanics & Handicraft

A TECHNICAL JOURNAL OF SCIENCE AND INDUSTRY

CONTENTS *for* JULY, 1945

Cover: Painting by Frederick J. Hoertz

News

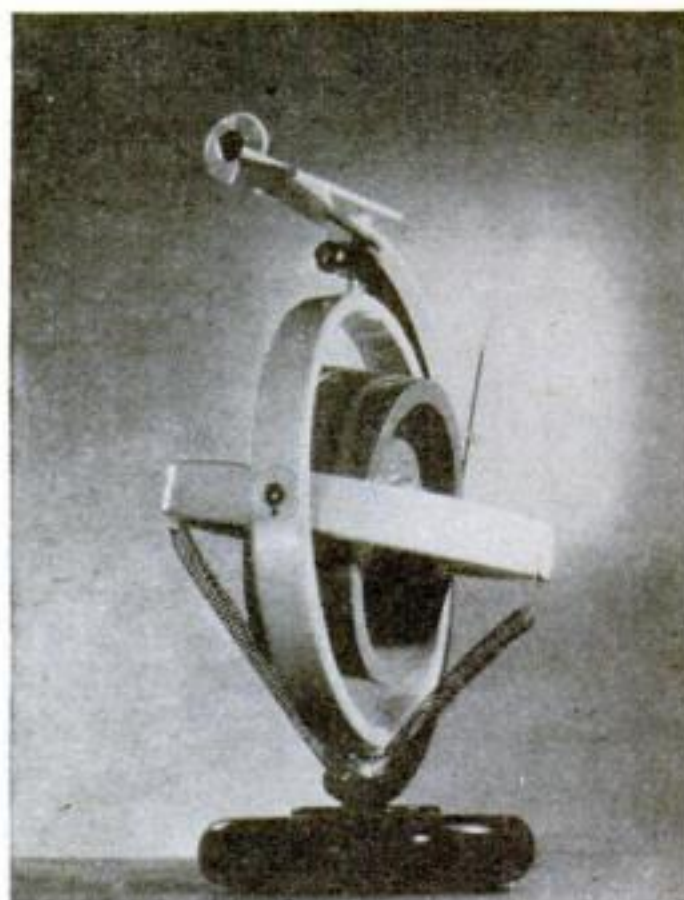
Yanks Lick Prison Hardships.....	65
Inside the Superfortress.....	69
Pershing Tank Has 90-mm. Gun.....	71
Biggest Gun on Wheels.....	76
Shakedown Cruise	80
Medical Science Conquers Virus.....	82
The Top That Aims a Gun.....	86
Grasshopper: Jeep with Wings.....	94
Plane of Many Faces.....	100
Temple of a Thousand Steps.....	108
Cooks and Clerks Stop Panzers.....	114
My Sweetheart's a Black Widow.....	116
Why Dice Behave as They Do.....	120
Jungle Poison Saves Lives.....	124
Tin Cans Dish It Out.....	128

Automobiles

Gus Turns Supersalesman.....	138
Ideas For Car Owners.....	141
Twin-Engine Busses.....	142

Home and Workshop

Hammer-and-Saw Furniture	154
Modeling Russia's Lagg 3.....	156
Bantam-Size Farm Wagon.....	158
Sailing Balance for Your Boat.....	164
Steel—King of Shop Metals.....	170
New Shop Ideas.....	176
Home Movie Processing Reels.....	179
Electronics Without Tubes.....	186
Carbon Dioxide Chemistry.....	200



GYROSCOPE. Jap suicide pilots, hurling themselves at our warships, ran into an unexpected obstacle—a top that calculates the lead angle for an antiaircraft gun in the twinkling of an eye. On page 86 Gold Sanders tells how the gyroscope, once only a scientific toy, has become one of the major weapons of modern warfare.

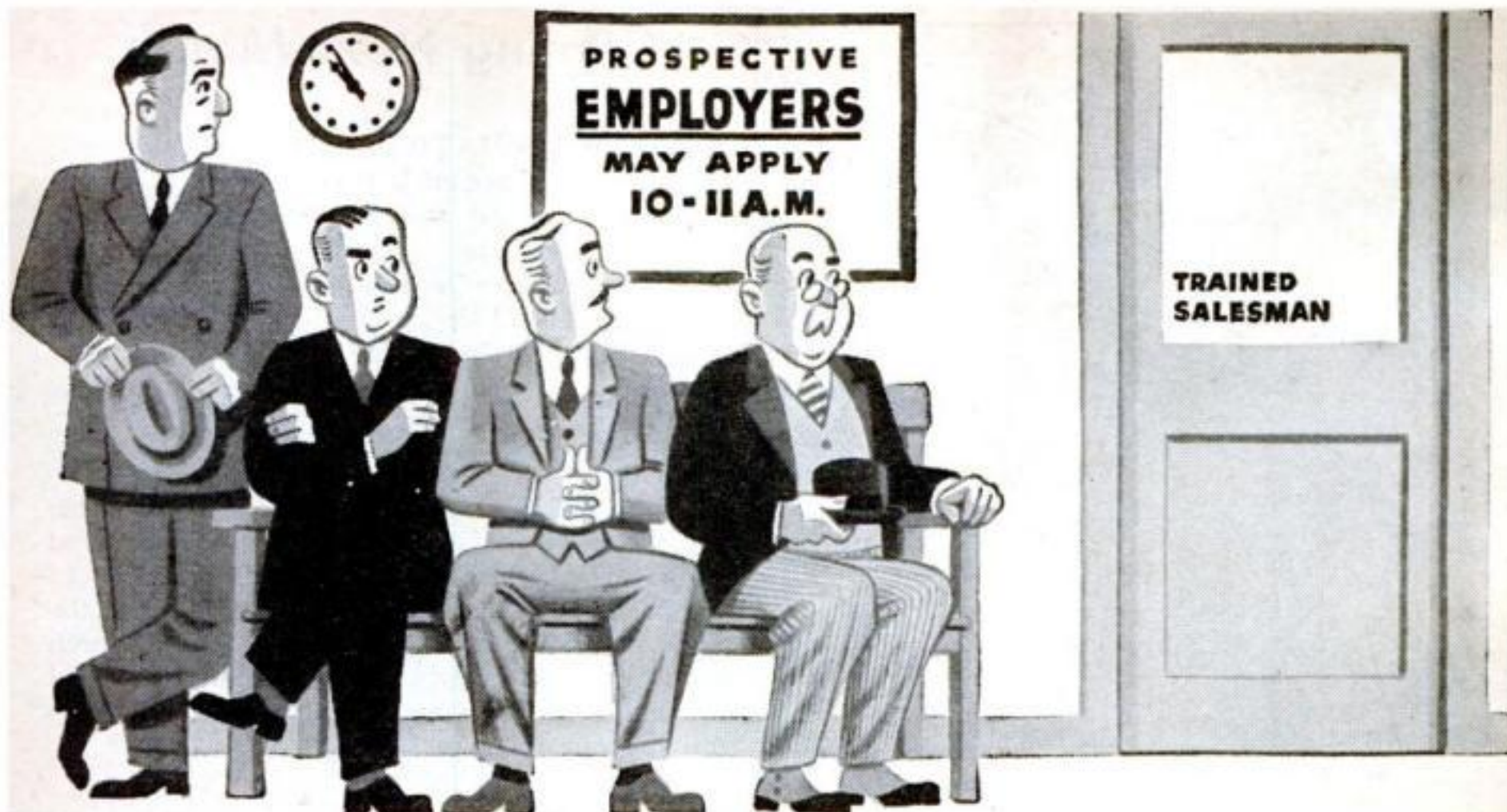
EDITOR Charles McLendon
ASSISTANT EDITOR Arthur Wakeling
AVIATION EDITOR C. B. Colby
HOME & WORKSHOP EDITOR Harry Walton

EDITORIAL ASSOCIATES: Fred O. Newman, news editor; Alden P. Armagnac, B. T. Richards, Harry Samuels, Michele de Santis, Volta Torrey, Frank Rowsome, Jr., Carl W. Bertsch, Ruth Westphal, Edward F. Allen, Devon Francis, Gold V. Sanders, James L. Freeman, R. P. Stevenson, Robert Gorman, Elsie E. Brandt.

ART ASSOCIATES: Stewart Rouse, William Patrick, Samuel Dukler, Evelyn Cooper.

PHOTOGRAPHY: W. W. Morris.

Published monthly at 353 Fourth Avenue, New York 10, N. Y., by Popular Science Publishing Co., Inc. Godfrey Hammond, President and Treasurer; R. C. Wilson, Raymond J. Brown, Charles McLendon, Stephen P. Glennon, Vice-Presidents; F. W. Briggs, Secretary. Entered as second-class matter Dec. 28, 1918, at the Post Office at New York under the act of March 3, 1879; additional entry as second-class matter at Dayton, Ohio. Entered as second-class matter at the Post Office Department, Canada. Printed in U.S.A. Copyright, 1945, by Popular Science Publishing Co., Inc. All rights reserved in the United States, Great Britain, and in all countries participating in the International Copyright Convention and the Pan-American Copyright Convention. Yearly subscriptions to United States and its possessions, \$2.50; Canada, \$3.00; foreign countries, excepting Canada, \$3.50. Subscribers must notify us of change of address four weeks in advance of the next publication date. Be sure to give both old and new address.



THIS is an unusual picture. It exaggerates the demand for Trained Salesmen. And that's not an easy thing to do.

Right now, you're seeing "Sales Help Wanted" columns in the newspapers—lengthy listings wholly separate from the general "Help Wanted" group covering all other jobs. That's proof of how keenly business needs men and women who can sell.

In tomorrow's greatest market, the demand will be even greater. Post-war competition means thousands of concerns seeking to increase the effectiveness of their selling forces . . . constantly

bidding, one against the other, for the services of trained salesmen.

The time to obtain such training is *now*. An I. C. S. Course is the way. These famous Schools teach the principles of modern salesmanship . . . show the student *how to apply them*.

This is instruction backed by a highly successful service organization. I. C. S. employs hundreds of field representatives of its own . . . has helped to train thousands of salesmen for many different industries. Courses give students the benefit of more than 53 years of I. C. S. sales experience. Mail the coupon *today* for full information.

INTERNATIONAL CORRESPONDENCE SCHOOLS



BOX 7625-L, SCRANTON 9, PENNA.

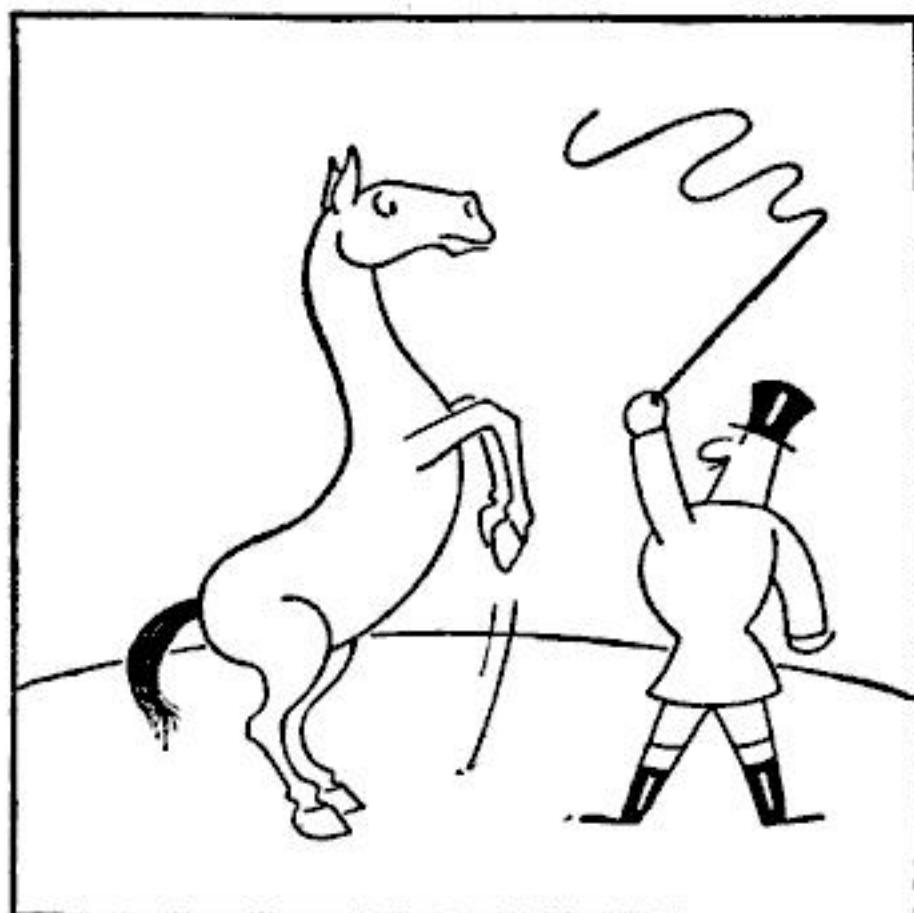
Without cost or obligation, please send me full particulars about the course *before* which I have marked X:

- | | | | |
|---|---|---|--|
| Business and Academic Courses
<input type="checkbox"/> Accounting <input type="checkbox"/> Advertising
<input type="checkbox"/> Arithmetic <input type="checkbox"/> Bookkeeping
<input type="checkbox"/> Business Correspondence
<input type="checkbox"/> Business Management
<input type="checkbox"/> Certified Public Accounting
<input type="checkbox"/> College Preparatory
<input type="checkbox"/> Commercial
<input type="checkbox"/> Cost Accounting
<input type="checkbox"/> Federal Tax
<input type="checkbox"/> First Year College
<input type="checkbox"/> Foremanship <input type="checkbox"/> French
<input type="checkbox"/> Good English <input type="checkbox"/> High School
<input type="checkbox"/> Higher Mathematics
<input type="checkbox"/> Illustrating <input type="checkbox"/> Motor Traffic
<input type="checkbox"/> Postal Service
<input type="checkbox"/> Salesmanship <input type="checkbox"/> Secretarial
<input type="checkbox"/> Sign Lettering
<input type="checkbox"/> Spanish <input type="checkbox"/> Stenography
<input type="checkbox"/> Traffic Management | Chemistry Courses
<input type="checkbox"/> Chemical Engineering
<input type="checkbox"/> Chemistry, Analytical
<input type="checkbox"/> Chemistry, Industrial
<input type="checkbox"/> Chemistry, Mfg. Iron & Steel
<input type="checkbox"/> Petroleum Refinery Operator's
<input type="checkbox"/> Plastics
<input type="checkbox"/> Pulp and Paper Making
Civil Engineering, Architectural and Mining Courses
<input type="checkbox"/> Architectural Drafting
<input type="checkbox"/> Architecture
<input type="checkbox"/> Building Estimating
<input type="checkbox"/> Civil Engineering <input type="checkbox"/> Coal Mining
<input type="checkbox"/> Contracting and Building
<input type="checkbox"/> Highway Engineering
<input type="checkbox"/> Lumber Dealer
<input type="checkbox"/> Reading Structural Blueprints
<input type="checkbox"/> Sanitary Engineering
<input type="checkbox"/> Structural Drafting
<input type="checkbox"/> Structural Engineering
<input type="checkbox"/> Surveying and Mapping | <input type="checkbox"/> Power House Electric
<input type="checkbox"/> Practical Electrician
<input type="checkbox"/> Practical Telephony
<input type="checkbox"/> Telegraph Engineering
Internal Combustion Engines Courses
<input type="checkbox"/> Auto Technician <input type="checkbox"/> Aviation
<input type="checkbox"/> Diesel-Electric
<input type="checkbox"/> Diesel Engines <input type="checkbox"/> Gas Engines
Mechanical Courses
<input type="checkbox"/> Aeronautical Engineering
<input type="checkbox"/> Airplane Drafting
<input type="checkbox"/> Flight Engineer
<input type="checkbox"/> Foundry Work
<input type="checkbox"/> Heat Treatment of Metals
<input type="checkbox"/> Industrial Engineering
<input type="checkbox"/> Industrial Metallurgy
<input type="checkbox"/> Mechanical Drafting
<input type="checkbox"/> Mechanical Engineering
<input type="checkbox"/> Mold-Loft Work
<input type="checkbox"/> Patternmaking
<input type="checkbox"/> Reading Shop Blueprints
<input type="checkbox"/> Sheet-Metal Drafting
<input type="checkbox"/> Sheet-Metal Worker
<input type="checkbox"/> Ship Drafting
<input type="checkbox"/> Ship Fitting | <input type="checkbox"/> Shop Practice
<input type="checkbox"/> Steel Mill Workers
<input type="checkbox"/> Tool Designing
<input type="checkbox"/> Welding, Gas and Electric
Radio Courses
<input type="checkbox"/> Electronics
<input type="checkbox"/> Radio, General
<input type="checkbox"/> Radio Operating
<input type="checkbox"/> Radio Servicing
Railroad Courses
<input type="checkbox"/> Air Brake <input type="checkbox"/> Car Inspector
<input type="checkbox"/> Locomotive Engineer
<input type="checkbox"/> Locomotive Fireman
<input type="checkbox"/> Railroad Section Foreman
Steam Engineering Courses
<input type="checkbox"/> Boilermaking
<input type="checkbox"/> Combustion Engineering
<input type="checkbox"/> Engine Running
<input type="checkbox"/> Marine Engineering
<input type="checkbox"/> Steam Electric
<input type="checkbox"/> Steam Engines
Textile Courses
<input type="checkbox"/> Cotton Manufacturing
<input type="checkbox"/> Rayon Weaving
<input type="checkbox"/> Textile Designing
<input type="checkbox"/> Woolen Manufacturing |
|---|---|---|--|

Name..... Age..... Home Address.....
 City..... State..... Present Position..... Working Hours..... A.M. to..... P.M.

Canadian residents send coupon to International Correspondence Schools Canadian, Ltd., Montreal, Canada.
 British residents send coupon to I. C. S., 71 Kingsway, London, W. C. 2, England.

DISCOUNT TO DISCHARGED VETERANS—SPECIAL TUITION RATES FOR MEMBERS OF THE ARMED FORCES



Coming Next Month

MILITARY AVIATION is less than 40 years old. The brief period between the U.S. Army's first airplane and the Superfortress raids on Japan has witnessed one of the greatest achievements in military history. Popular Science is privileged to tell the dramatic story in pictures from the official pictorial history of the Army Air Forces.

CHICKENS IN A QUONSET HUT? Well, that's one of the postwar plans we uncovered when we asked readers how they intended to use surplus war goods soon to appear on the market. This contest announced in the March issue brought in many interesting and practical suggestions. You may get a tip that will help you in your work or hobbies.

WHAT DO YOU KNOW about thermostats? These automatic watchmen stand on guard for you in your home and your car. In planes, ships, and factories their mechanical hands throw switches and open or close valves. A B-29 Superfortress has 350 of them. An article by Gold V. Sanders will help you to understand and appreciate their tireless service.

PEACETIME ROLES for the handie-talkie and the walkie-talkie are discussed in a matter-of-fact, down-to-earth story. Large surpluses of these two-way radios may soon be available for civilian use, and the FCC foresees a definite use for the equipment. Read this latest analysis of what we may expect in the way of mobile, two-way communication apparatus.

ICE, always one of the greatest hazards of flight, gains added terrors with the high altitudes and varying climates of global war. How are aircraft designers meeting its challenge? You'll be thrilled by the story of man's long battle with the invisible enemy that drags planes down, and of his latest methods of overcoming it.

PLASTICS will invade your home workshop before long, so get in on the ground floor and learn a few things about the tough, transparent materials that have made war headlines in bomber noses and gun turrets. We'll show you how you can saw, drill, carve, sand, and buff it to a jewellike finish; how you can heat it and bend it with your fingers. Directions for your first plastic job—a cigarette box—will be given.

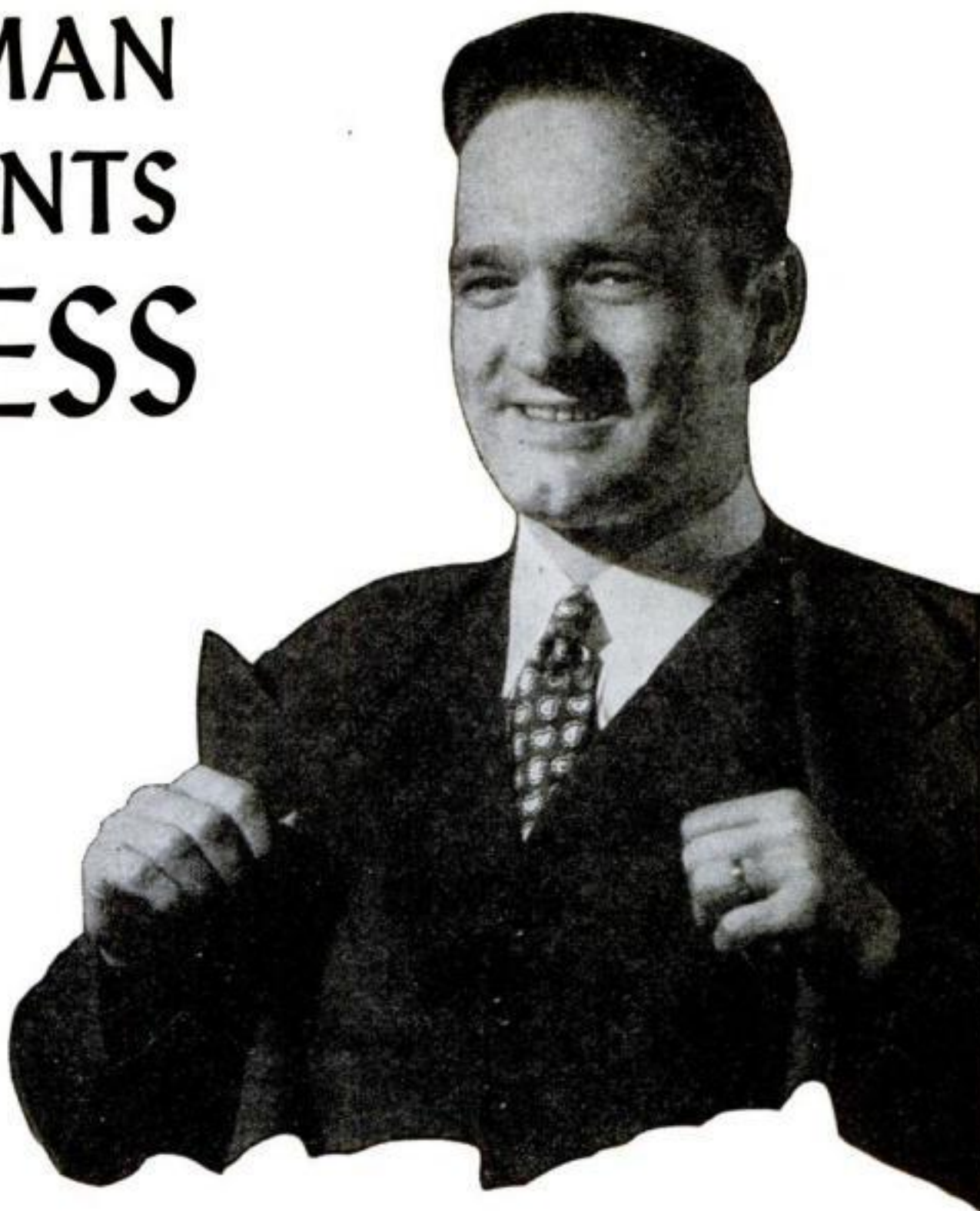
TO THE MAN WHO WANTS SUCCESS

after the WAR!

If you want success and security when peace comes, prepare for it now. Make sure that you have the trained ability that employers will want and pay for in the post-war adjustment.

As business converts back to civilian goods, there will be urgent call for accountants, bookkeepers, salesmen, sales and credit correspondents, traffic managers, marketing men, secretaries, office managers and legally trained executives.

For 36 years, LaSalle has been training adults in their spare time for such positions.



It knows how. It can train you—quickly, thoroughly, at moderate cost, without interruption to your present work.

Mark the coupon below for our free booklet about the field of your interest. It costs nothing to get the facts and they may lead you to larger security and success—now and after the armistice whistles blow.

LASALLE EXTENSION UNIVERSITY

A Correspondence Institution

417 SOUTH DEARBORN STREET, DEPT. 783-R

CHICAGO 5, ILLINOIS

I am interested in knowing what your training is and how it can help me in the post-war adjustment. Please send me your free booklet on the field I have marked at right.

- ☐ Accounting
- ☐ Bookkeeping
- ☐ Salesmanship
- ☐ Business English

- ☐ Law: LL.B. Degree
- ☐ Business Law
- ☐ Office Management
- ☐ Business Correspondence
- ☐ Stenotypy: machine shorthand

- ☐ Traffic Management
- ☐ Executive Management
- ☐ Foremanship
- ☐ Industrial Management

Name.....Age.....

Position.....Address.....

City and State.....

JULY, 1945

Buy War Savings Bonds and Stamps regularly.

9

THE KNIFE THAT DOES EVERY CUTTING JOB QUICKER • EASIER • BETTER

Paper, rubber, wood, plastics
... all the same to X-acto

You never had a knife that fits so neatly to your hand, gives you such perfect cutting control. You never had a knife so sharp and sure, that cuts paper dolls, or heavy wood gas-motor models with equal ease. With 3 different handle styles, and 8 blade shapes, X-acto gives you what every persnickety craftsman needs—a knife that's always sharp, always ready, always suited to the moment's need. No other knife at any price has all

these plus advantages. Get yourself an X-acto—it's the knife of your life!



A TWIST, A TWIRL, THAT'S ERL! Any X-acto blade fits snugly, firmly into any X-acto handle. To reblade, just twist the handle, pull out the blade, insert a new one, twist handle back, and there you are!

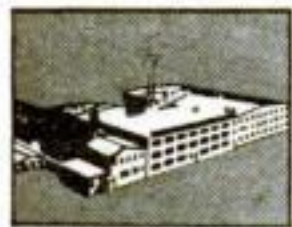
FOR WORK OR PLAY...
in Shop, School or Hobby Den



Favorite for models
Ships? Tanks? Planes? Trains? X-acto cuts easily with or across the grain, round difficult curves and corners.



For artists' sake
Every art and photographer's studio needs X-acto. For drawing, patching, retouching, cutting mats or frames.



Fine business!
Industry finds many uses for X-acto, e.g. For drafting; trimming dummies; finishing moulded rubber parts; erasers.

X-ACTO TOOLS, TOO

X-acto Planer, single-bevel blade . .	\$1.00
X-acto Sander, 3 grades sandpaper . .	.50
X-acto Hand Drill & Pin Vise . . .	.75
X-acto Hobbycrafter's Saw (not shown)	1.25
X-acto Balsa Stripper, movable guide .	1.00



WONDERFUL GIFT!



"It's a treasure chest! It's a lulu!" wrote Mr. F.L. of Stamford, Conn., on receiving his X-acto Knife Chest. 3 X-acto Knives, with an assortment of 12 X-acto Blades, in a handy wooden box, \$3.50. Deluxe All-Metal Knife Chest, \$5.

HERE'S "HOW TO"

Send for these helpful booklets. Only 10c each.



How to Build Scale Model Planes; Boat Whittler's Handbook; Twelve Techniques—The Knife as a Drawing Instrument; Commercial Artists' Handbook. Full of ideas.

X-acto Crescent Products Co., Inc.
440 Fourth Ave., New York 16, N. Y.

8 blade shapes removable, interchangeable

No. 25
For carving, whittling

No. 19
Broad blade for chiseling

No. 23X
2 edged all-purpose blade

No. 22
For long cuts, whittling

No. 24
For light chiseling; paper

No. 10
For small, fine whittling

No. 11
For fine angles; deep cuts

No. 16
For small holes; fine paper

3 Bulldog-grip handle styles



x-acto

KNIVES & TOOLS

At better hardware, hobby, and gift shops—or if not available write direct to X-acto Crescent Products Co. Inc., 440 Fourth Avenue, New York 16, N. Y.

No. 1 X-acto for fine delicate cutting 50¢ ea. With 5 extra blades	\$1.00
No. 2 X-acto for medium work 50¢ ea. With 5 extra blades . . .	1.00
No. 62 X-acto Double set with 10 extra blades	2.00
No. 82 X-acto Fitted wooden knife chest	3.50
No. 83 X-acto De Luxe chest with extra blades	5.00



J. E. SMITH, President,
National Radio Institute
Our 31st Year of Training Men
for Success in Radio

I WILL SEND A SAMPLE LESSON FREE to PROVE I can Train You at Home in Spare Time to BE A RADIO TECHNICIAN

I Trained These Men



**\$35 to \$45 a Week
in Own Shop**
"Previous to en-
rolling for your
radio training I
made \$12 per
week in a hard-
ware store. Now
I operate my own
repair shop, and often clear \$35
to \$45 a week."—FREDERICK
BELL, 76 Golf Ave., St. Johns,
Newfoundland.



**\$600 a Year
in Spare Time**
"At present I am
doing spare time
radio work. I
earned money in
radio before grad-
uating. My profits
for the last twelve
months were
\$600."—ERWIN F. BOETT-
CHER, Marinette, Wisconsin.

Chief Engineer in Radio Station

"When I signed
up with N.R.I.
I had no other
Radio experi-
ence. I am now
Chief Engineer
for Station
WIBG, and have
supervised in-
stallation of new
modern broadcasting studios
and equipment."—JOHN H.
HENNINGER, 4744 Meridian
Street, Philadelphia, Penna.

I want to give every man who's interested
in Radio, either professionally or as a hobby,
a copy of my Lesson, "Getting Acquainted
with Receiver Servicing"—absolutely FREE!
It's a valuable lesson. Study it—keep it—use
it—without obligation! And with it I'll send
my 64-page, illustrated book, "Win Rich
Rewards in Radio." FREE. It describes
many fascinating jobs in Radio, tells how
N.R.I. trains you at home in spare time,
how you get practical experience with SIX
KITS OF RADIO PARTS I send.

The "Sample" Lesson will show you why the
easy-to-grasp lessons of the N.R.I. Course have
paved the way to good pay for hundreds of other
men. I will send it to you without obligation.
MAIL THE COUPON!

Future for Trained Men Is Bright in Radio, Television, Electronics

The Radio Repair business is booming NOW.
There is good money fixing Radios in your spare
time or own full time business. And trained Radio
Technicians also find wide-open opportunities in
Police, Aviation and Marine Radio, in Broadcast-
ing, Radio Manufacturing, Public Address work,
etc. Think of the boom coming when new Radios
can be made! And think of even greater opportu-
nities when Television, FM, Electronics, can be
offered to the public! Get into Radio NOW.

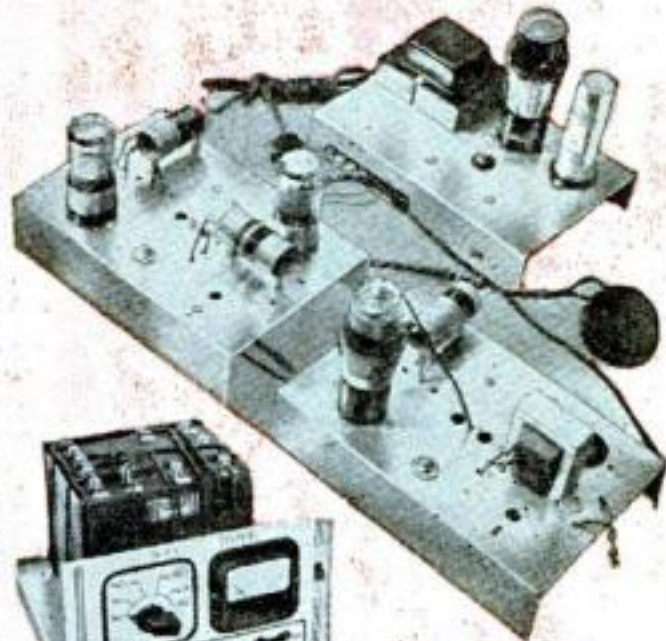
Many Beginners Soon Make \$5, \$10 a Week EXTRA in Spare Time

The day you enroll I start sending EXTRA
MONEY JOB SHEETS to help you make EXTRA
money fixing Radios in spare time while learn-
ing. You LEARN Radio principles from my easy-
to-grasp Lessons—PRACTICE what you learn by
building real Radio Circuits with the six kits of
Radio parts I send—USE your knowledge to make
extra money while getting ready for a good full
time Radio job.

Find Out What N.R.I. Can Do for YOU

MAIL COUPON for Sample Lesson and FREE
64-page book. It's packed with facts about oppor-
tunities for you. Read the details about my
Course. Read letters from men I trained, telling
what they are doing, earning. Just MAIL COU-
PON in an envelope or paste it on a penny postal.
—J. E. SMITH, President, Dept. 5GP3, Na-
tional Radio Institute, Pioneer Home Study
Radio School, Washington 9, D. C.

You Build These and Many Other Radio Circuits with Kits I Supply



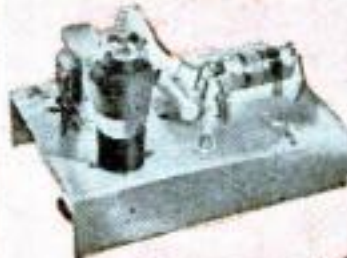
SUPER- HETERODYNE CIRCUIT

(above) Preselec-
tor, oscillator -
mixer-first detec-
tor, i.f. stage,
diode - detector -
a.v.c. stage, audio
stage. Brings in
local and distant
stations.



MEASURING INSTRUMENT

(above) you build
early in Course.
Vacuum tube mul-
timeter, measures
A.C., D.C., R.F.
volts, D.C. cur-
rents, resistance,
receiver output.



A. M. SIGNAL GENERATOR

(left) build it
yourself. Provides
amplitude - mod-
ulated signals for
test and experi-
mental purposes.

Television Electronics Frequency Modulation

My up-to-date Course
includes training in
these new develop-
ments.

GOOD FOR BOTH 64 PAGE BOOK SAMPLE LESSON FREE

Mr. J. E. Smith, President, Dept. 5GP3
NATIONAL RADIO INSTITUTE, Washington 9, D. C.
Mail me FREE without obligation, Sample Lesson and
64-page book, "Win Rich Rewards in Radio." (No
salesman will call. Please write plainly.)

Name.....Age.....

Address.....

City.....Zone.....State.....4PR



In Your Mind's Eye

The Secret of MENTAL CREATING

IF you just like to dream, read no further. There comes a time when your fancies *must be* brought into light—and stand the test of every-day, hard realities. Are you one of the thousands—perhaps millions—whose thoughts never get beyond the stage of *wistful wishing*? Do you often come to from a daydream with the sigh, "If only I could bring it about—*make it real*?"

All things begin with thought—it is what follows that may take your life out of the class of those who hope and dream. Thought energy, like anything else, can be dissipated—or it can be made to produce actual effects. *If you know how to place your thoughts* you can stimulate the creative processes within your mind—through them you can assemble things and conditions of your world into a happy life of accomplishment. *Mental creating* does not depend upon a magical process. It consists of *knowing how* to marshal your thoughts into a power that draws, compels and organizes your experiences into a worth-while design of living.

ACCEPT THIS *Free* BOOK

Let the Rosicrucians tell you how you may accomplish these things. The Rosicrucians (not a religious organization), a world-wide philosophical fraternity, have preserved for centuries the ancients' masterful knowledge of the functioning of the inner mind of man. They have taught men and women how to use this knowledge to *recreate their lives*. They offer you a free copy of the fascinating book, "The Mastery of Life." It tells how you may receive this information for study and use. Use coupon opposite.

The **ROSICRUCIANS**
(AMORC)

SAN JOSE

CALIFORNIA

SCRIBE: M. R. J.
The Rosicrucians (AMORC),
San Jose, California.

Please send free copy of "The Mastery of Life,"
and I shall read it as directed.

Name.....

Address.....

City.....

Yes! I Turn Weaklings into HE-MEN!



Let Me Make YOU a NEW MAN

—in Just 15 Minutes a Day!

YES, Sir, *that's my job!* I "RE-BUILD" skinny, run-down weaklings—fellows so embarrassed by their second-rate physical condition that they always hang back, let others walk off with the best jobs, the prettiest girls, the most fun and popularity. I turn weaklings like these into HE-MEN—REAL SPECIMENS OF HANDSOME, MUSCULAR MANHOOD—overflowing with pep, power, vitality! I'll PROVE that, in only 15 minutes a day, I can make YOU a NEW MAN too!

I'LL PROVE What I Say

I know what it's like to have a body others laugh at. I myself was once a 97-pound weakling—timid, ill-at-ease, ashamed to strip for sports or a swim.

Then I discovered "Dynamic Tension." It changed me from a scrawny "string-bean" into the winner of the title, "THE WORLD'S MOST PERFECTLY DEVELOPED MAN." Since then my "Dynamic Tension" has transformed thousands of other weak, no-muscle men into real Atlas Champions!

Charles Atlas

Holder of title, "The World's Most Perfectly Developed Man."

What I'll Do For YOU!

Where do YOU want solid, tough LIVE MUSCLE? Are you fat and flabby? Or skinny and gawky? Are you short-winded, sluggish, always tired? I'll give you a sledge-hammer fist and mighty forearm. Add inches to your biceps. Put a coat of muscle straight across your stomach. Change those legs that are "always tired" into mighty, vigorous columns of speed and stamina. You'll begin to know what it feels like to really LIVE!

SEND FOR FREE BOOK

Mail coupon right now. I'll send you a FREE COPY of my famous illustrated book, "Everlasting Health and Strength." In it I talk to you in straight-from-the-shoulder language—show you actual photographs of myself and other fellows who became NEW MEN, my way. You'll read the story of "Dynamic Tension"—what it has done for others, what I'm ready to PROVE in only 15 minutes a day, it can do for YOU! Send for this book today! AT ONCE! Address me personally. CHARLES ATLAS, Dept. 17, 115 East 23rd Street, New York 10, N. Y.



**CHARLES ATLAS, Dept. 17
115 East 23rd Street, New York 10, N. Y.**

I want the proof that your system of "Dynamic Tension" will help make a New Man of me—give me a healthy, husky body and big muscular development. Send me your free book, "Everlasting Health and Strength."

Name _____
(Please print or write plainly)

Address _____

City _____ Zone No. _____
(if any) State _____

☐ Check here if under 16 for Booklet A.

I'LL SHOW YOU HOW TO SUCCEED IN RADIO

Here's the right training for Big Post-War Pay!



F. L. Sprayberry, one of the country's foremost Radio Teachers.



A RADIO SERVICE BUSINESS OF YOUR OWN



A GOOD JOB IN RADIO & TELEVISION BROADCASTING



RADIO-ELECTRONIC SERVICE ENGINEER

BE A RADIO ELECTRONICIAN

NOW! YOU CAN PREPARE AT HOME IN SPARE TIME FOR AMAZING OPPORTUNITIES AHEAD IN RADIO — ELECTRONICS — TELEVISION



I SUPPLY A FULL RADIO SET for practical easy LEARNING



The offer I make you here is the opportunity of a lifetime. It's your big chance to get ready for a wonderful future in the swiftly expanding field of Radio-Electronics INCLUDING Radio, Television, Frequency Modulation and Industrial Electronics. Be wise! NOW'S the time to start. Opportunities ahead are tremendous! No previous experience is necessary. The Sprayberry Course starts right at the beginning of Radio. You can't get lost. It gets the various subjects across in such a clear, simple way that you understand and remember. And, you can master my entire course in your spare time. It will not interfere in any way

with your present duties. Along with your Training, you will receive my famous **BUSINESS BUILDERS** which will show you how to make some nice profits while learning.

Prepares You for a Business of Your Own or Good Radio Job

My training will give you the broad, fundamental principles so necessary as a background, no matter which branch of Radio you wish to specialize in. I make it easy for you to learn Radio Set Repair and Installation Work. I teach you how to install and repair Electronic Equipment. In fact, you'll be a fully qualified **RADIO-ELECTRONICIAN**, equipped with the skill and knowledge to perform efficiently and to make a wonderful success of yourself.

SPRAYBERRY TRAINING GIVES YOU BOTH TECHNICAL KNOWLEDGE — SKILLED HANDS

There's only one right way to learn Radio Electronics. You must get it through simplified lesson study combined with actual "shop" practice under the personal guidance of a qualified Radio Teacher. It's exactly this way that Sprayberry trains you supplying real Radio parts for learn-by-doing experience right at home. Thus, you learn faster, your understanding is clear-cut, you acquire the practical "know how" essential to a good-paying Radio job or a Radio business of your own.

I'll Show You a New, Fast Way to Test Radio Sets Without Mfg. Equipment.

The very same Radio Parts I supply with your Course for gaining pre-experience in Radio Repair work may be adapted through an exclusive Sprayberry wiring procedure to serve for complete, fast, accurate Radio Receiver trouble-shooting. Thus, under Sprayberry methods, you do not have one

cent of outlay for manufactured Test Equipment which is not only expensive but scarce.

Read What Graduate Says "One Job Nets About \$26.00"

"Since last week I fixed 7 radios, all good-paying jobs and right now I am working on an amplifier system. This job alone will net me about \$26.00. As long as my work keeps coming in this way, I have only one word to say and that is, 'Thanks to my Sprayberry training' and I am not afraid to boast about it." — ADRIEN BENJAMIN, North Grosvenordale, Conn.

DON'T PUT IT OFF!

Get the facts about my training—now! Take the first important step toward the money-making future of your dreams. All features are fully explained in my big, illustrated **FREE** Catalog which comes to you along with another valuable **FREE** book you'll be glad to own. Mail Coupon AT ONCE!

JUST OUT! FREE!

"How to Read Radio Diagrams and Symbols"

. a valuable new book which explains in simple English how to read and understand any Radio Set Diagram or circuit. Includes translations of all Radio symbols. Send for this **FREE** book now, and along with it I will send you another big **FREE** book describing my Radio-Electronic training.



GET FREE BOOKS

SPRAYBERRY ACADEMY OF RADIO
F. L. Sprayberry, President
Room 5575, Pueblo, Colorado

Please rush my **FREE** copies of "How to MAKE MONEY in RADIO, ELECTRONICS and TELEVISION," and "How to READ RADIO DIAGRAMS and SYMBOLS."

Name Age

Address

City State

(Mail in plain envelope or paste on penny postcard)

INVENTORS

NOW Is the Time to PATENT and SELL Your Invention

Now, more than ever before, is the right time to patent your invention. Why? Because manufacturers everywhere presently engaged in war production are looking ahead to the future by buying up patent rights now, so they will have new and attractive items to make and sell for civilian consumption as soon as the war is over. This is what happened during and after the last war. Hence, the smart thing for you to do is to look ahead to the future too. Protect your invention and yourself by applying for a patent now.

Patent Guide Shows What To Do

Our "Patent Guide for the Inventor" answers many important questions concerning Patents that inventors constantly ask. It tells what facts, details, drawings, sketches, etc. are necessary to apply for a Patent; how to protect your invention through dated and witnessed disclosure; how to do this AT ONCE to safeguard your rights; how Patent Office Records can be checked to determine whether the invention is probably patentable before filing fees need be paid; discusses costs involved and a practical way these can be paid as the application progresses. It tells how some inventors secured financial backing; how many simple inventions have proved large commercial successes; how Patents covering improvements also can be profitably utilized and marketed; tells countless other facts of interest.

Why You Need Expert Assistance

The Patent Laws were enacted for your benefit—to give you protection for the features of your invention which are Patentable. But these features must be legally and concisely set forth in the form of "claims." This phase of the procedure is so complex that the Patent Office advises the Inventor to engage a competent Registered Patent Attorney. We maintain a large staff—carefully trained registered patent attorneys—expert draftsmen—experienced searchers—to serve you. We have been serving inventors for more than 20 years.

Take First Step Now

With the Patent Guide you will receive also Free a "Record of Invention" form which will enable you at once to establish the date of your invention, before you file your Patent application. This step costs you nothing yet may be vital to your success. Remember—in Patent Matters, ACTION is IMPORTANT. Delay can be costly. Mail the coupon in an envelope, or paste it on a penny postcard NOW.

CLARENCE A. O'BRIEN & HARVEY B. JACOBSON

"Worthy of your Trust"

Registered Patent Attorneys

52-G Adams Building
Washington 4, D. C.

Get This
FREE BOOK

IMMEDIATELY MAIL COUPON TODAY!

Get
**FREE
COPY**



**CLARENCE A. O'BRIEN
& HARVEY B. JACOBSON**

CLARENCE A. O'BRIEN & HARVEY B. JACOBSON
Registered Patent Attorneys before the United States Patent Office
52-G Adams Building, Washington, D. C.

Please send me your 48-Page "Patent Guide for the Inventor" and your specially prepared "Record of Invention" form FREE. This request does not obligate me.

Name _____

Address _____

City _____ State _____

(Please write or print plainly.)

MEN whether you are 16 or 40

Come to
COYNE
for a great
future in



RADIO-ELECTRONICS

"Learn-by-Doing" on Real Radio Apparatus!



Prepare for a great Peace time future and a good job in Radio-Electronics now. Coyne "LEARN BY DOING" training covers latest developments in this field. Prepare quickly, easily. Fascinating well paid work in maintenance, installation and servicing Radio-Electronic equipment.

TELEVISION

If you have an all-around Radio-Electronic training, there are great opportunities for you. Tremendous expansion in Radio-Electronics, Frequency Modulation and Television predicted after the war—a world of new opportunities. Get ready for a Peace time future and a good job NOW with practical Coyne Radio Training.

Many Branches If You Have All-around Training

Why be satisfied with a narrow, no-future line when by putting in a short time in my Shops, you can qualify for unlimited opportunities in RADIO-ELECTRONICS, today's fast-growing field! These pictures show only a few of the big jobs for trained Radio-Electronics Men.

I'LL FINANCE YOUR TRAINING!

Don't let lack of money hold you back. You can GET TRAINING first—then pay your tuition IN EASY MONTHLY PAYMENTS STARTING 60 DAYS AFTER YOUR TRAINING PERIOD IS OVER. I also help you get part-time work to help pay living expenses while training if you need it, and give you Lifetime Job Service as a Coyne graduate.

SEND FOR FREE BOOK

Fully illustrated with big pictures of my Shops—facts about your future. Mail coupon now. No obligation. No salesman will call. Act today!

H. C. LEWIS, Pres.
**RADIO-ELECTRONICS DIVISION
COYNE ELECTRICAL SCHOOL**
500 S. Paulina St., Dept. B5-4H, Chicago 12

We have facilities for men with physical disabilities. If you have a physical disability of any kind check coupon below for details.

H. C. LEWIS, Pres., Radio-Electronics Division, COYNE ELECTRICAL SCHOOL, 500 S. Paulina St., Dept. B5-4H, Chicago 12, Illinois

Send FREE BOOK, "Your Future in Radio-Electronics" and details of easy "Pay-After-Graduation" plan. ☐ Send physical disability details.

NAME.....AGE.....

ADDRESS.....

CITY.....STATE.....

Buy War Savings Bonds and Stamps regularly.

GET INTO PLASTICS

Start
Your Own
Business

BE YOUR OWN BOSS
Small Capital — Work at Home



FABRICATION



CASTING

Get into new Plastics business. Start in your own home. Small Capital needed. As you increase your knowledge and skill, you can grow with this Big Industry. This opportunity is yours today... so get started now in what may mean a Big paying Plastics business of your own — or prepare for post-war Plastics employment. This New educational plan gives you the sound fundamental knowledge plus the practical training you need to be a success in Plastics. The actual practical work consists of working with many different types of Plastics materials — teaching you in your own home, fabrication, shaping, forming, finishing, cementing methods, mold making, casting, compounding, dyeing, etc. For full information send this ad with your name and address in an envelope or paste on a penny postcard to Dept. M.

PLASTICS TECH 4701 Euclid Avenue
Cleveland 3, Ohio

**RADIO,
ELECTRONICS
and YOU!**

THERE are big rewards in the communications line for the Radio man who has the answers! Too, the equipment that has made Radio communication possible is functioning now in other rewarding fields. Electron tubes in industry promise a whole new World of Electronics. I. C. S. has a variety of Radio Courses and a great new standard Electronics Course. Write for booklet, pick your Course.

International Correspondence Schools, Box 7626-L, Scranton 9, Pa.



ENGINEERING

TRI-STATE COLLEGE

B. S. Degree in 27 Months

Distinguished for technical 2 1/4-year courses in Civil, Electrical, Mechanical, Chemical, Radio, Aeronautical Engineering; Business Administration, Accounting, and Secretarial Science.

EX-SERVICE MEN can complete work here in shortest possible time. Special Prep, Dep't. Also REFRESHER COURSES, 36-Week Courses in Surveying, Drafting, Low tuition, Low living costs, Cosmopolitan student body. 62nd year. Enter Sept., Jan., March, June. Catalog. 575 College Ave. ANGOLA, INDIANA

RADIO

ENGINEERING, Broadcasting, Servicing, Electronics, Aviation, Marine & Police Radio taught thoroughly. 48 weeks' Engineering course equivalent to 3 years' college radio work. All expenses low. Co-educational. Catalog upon request. Valparaiso Technical Institute. Dept. 503 Valparaiso, Ind.



Be an ARTIST!

—Train at Home in Your Spare Time for a Profitable Career—
The fascinating field of Art offers commercial opportunities to men and women. COMMERCIAL ART, CARTOONING, DESIGNING all in one complete course. TWO ART OUTFITS furnished. Learn to draw step-by-step. Trained Artists are capable of earning \$30, \$50, \$75 a week. Write today for full information in FREE BOOK, "Art for Pleasure and Profit." Mail coupon now.

FREE BOOK gives details

Washington School of Art, Studio 137P
1115—15th St., N. W., Washington 5, D. C.

Name.....Age.....

Address.....

City.....State.....

This **FREE BOOK** *Helps..*

INVENTORS

TO PROTECT THEIR INVENTIONS



MODERN BUSINESS WANTS INVENTIONS

Practical and novel inventions are in big demand today. The opportunity for quick money is enticing. Sales sources are many if your invention has merit. But, be *sure*—before you place your device in strange hands—that it is fully protected. A United States Patent gives you this protection. *The first step toward inventive success always is—and always has been—the application for a U. S. Patent. There is no other way to protect your invention in accordance with the laws of this country.*

MAKE THIS RECORD NOW If you have an invention, and wish to secure it for the future, act at once. Have it dated now and recorded in our office. We will send you this **FREE Invention Record Form** for the purpose. Fill out the Invention Record Form fully describing the nature of your invention. Make a sketch of its main features. Mail it to us and we will record the date it was received in our office. The earlier the date the better your chance of combating rival inventors who may lay claim to your idea later. *Don't delay a single minute in taking this important step. Your whole future may depend upon it. Mail the coupon for our FREE Invention Record Blank and New FREE Book Today!*

HOW WE SERVE YOU AS REGISTERED PATENT ATTORNEYS The U. S. Patent Office strongly recommends—unless the inventor is familiar with such matters—that he employ the services of a Registered Patent Attorney in the preparation of his Patent Application. We are Registered Patent Attorneys fully qualified to represent you at the Patent Office. We have had long experience in studying hundreds of types of inventions. This gives us the ability to judge your invention and to describe it accurately and convincingly in technical language. It gives us the perception to center arguments upon those details of your invention which, in our judgment, will be looked upon most favorably by the Patent Office Examiner.

Mail the coupon today for our new **FREE Book**, "How to Protect, Finance and Sell Your Invention," and our **FREE Invention Record Form**—maybe this step will pave the way to future security for you and your family. **Act Today!**

We paint no glowing road to fortune—but if you have an invention . . . if it serves a definite new need . . . if the public accepts it—we can tell you it may provide the security and benefits you are seeking.

McMORROW & BERMAN

Patent Attorneys
142-B Atlantic Building
Washington 4, D. C.

JULY, 1945

FREE
Invention Record

Know How Successful Inventors Protect and Sell Their Inventions

Our new **FREE Book** is the latest volume on Inventions and Patents off the press. It's a book every inventor should have. Mail the coupon today for our book "How to Protect, Finance and Sell Your Invention" and learn these important facts—

- How to know if there is a prior U. S. patent on your invention.
- How to save steps in getting patent action.
- How we prepare your application for presentation to the Patent Office.
- How you may patent an improvement on something in use now.
- How to obtain funds to patent and promote your invention.
- How to find a buyer or backer for your invention.
- How to protect yourself in making royalty agreements.

These and many other inventive facts you'll learn by reading our new **FREE Book**, "How to Protect, Finance and Sell Your Invention."

Mail **COUPON NOW!**
McMORROW & BERMAN

PATENT ATTORNEYS
142-B Atlantic Building, Washington 4, D. C.
Send me your new **FREE book**, "How to Protect, Finance and Sell Your Invention"—and "Invention Record" form at once. I understand that this request does not obligate me.

NAME..... ADDRESS.....
CITY..... STATE.....
(Write or print name clearly)

Buy War Savings Bonds and Stamps regularly.

"I'll show YOU how to make yourself COMMANDO-TOUGH



...in double-
quick time

...OR IT WON'T COST YOU A CENT!"

says *George F. Jowett*

WORLD'S GREATEST BODY BUILDER

Let me prove to YOU that you can put inches of dynamic muscles on your arms! Add inches to your chest! Broaden your shoulders and power-pack the rest of your body. I can do for you what I've done for thousands the world over, including many officers and men now in the U.S. and British Armed Forces!

GIVE ME 10 MINUTES A DAY!

I'll Show You My Secrets Of Body Building

I'll help you learn the "Progressive Power Method" through which I rebuilt myself from a physical wreck to the holder of more strength records than any other living athlete or teacher! No matter how skinny or flabby you are, you can learn my methods right in your own home. Through my proved secrets I show you how to develop your power, inside and out, until YOU are fully satisfied that you are the man you want to be. "The Jowett System," says R. F. Kelly, Atlantic City, Physical Director, "is the greatest in the world!"

PROVE TO YOURSELF IN ONE NIGHT!

Send only 25c for test Course, "Molding a Mighty Arm." Read it the evening it arrives—learn from experience the thrill you can give your muscles!

SEND FOR THESE FIVE FAMOUS COURSES IN BOOK FORM

ONLY 25c EACH
or ALL 5 for \$1.00

If you want a physique that will inspire respect from men, and admiration from women... ACT LIKE A HE-MAN! Decide at once! The famous book, "Nerves of Steel—Muscles Like Iron" will be included FREE! Priceless for the strength fan! Full of photos of marvelous power-bodied men who will show you what Jowett has done for them and how he can do the same for you. Reach out... Grasp this Special Offer today!

Jowett Institute of Physical Culture
230 Fifth Avenue
Dept. 865B
New York 1, N.Y.

This
Book
Free!



BOOK WITH PHOTOS OF FAMOUS STRONG MEN
MAIL COUPON NOW

FREE



Jowett Institute of Physical Culture
230 Fifth Avenue, Dept. 865B, New York 1, N.Y.

George F. Jowett: Your proposition looks good to me. Send by return mail, prepaid, the courses checked below, for which I enclose (). Include FREE book of PHOTOS.

George F.
Jowett
Champion of
Champions

- | | |
|--|---|
| <input type="checkbox"/> All 5 courses for... \$1 | <input type="checkbox"/> Molding Mighty Legs 25c |
| <input type="checkbox"/> Molding a Mighty Arm 25c | <input type="checkbox"/> Molding a Mighty Grip 25c |
| <input type="checkbox"/> Molding a Mighty Back 25c | <input type="checkbox"/> Molding a Mighty Chest 25c |
| <input type="checkbox"/> Send all 5 C.O.D. (\$1 plus postage.) No orders less than \$1 sent C.O.D. | |

NAME.....Age.....
(Please print plainly. Include Zone Number.)

ADDRESS

Buy War Savings Bonds and Stamps regularly.

Become a REAL ESTATE Specialist

BIG opportunities! U. S. Housing Administration Survey reveals 12,600,000 homes needed. Vast population shifts, gov't. loans to veterans, widespread urge to "buy something real," higher incomes—mean tremendous real estate expansion. Prepare NOW to cash in on big profits. Learn in spare time at home. No need to quit present job. Start "on the side"—then build up full time business as your own boss; pleasant outside work, your own working hours.

Write for FREE BOOK

Our practical home-study course prepares you for this money-making, big-future business. No previous experience needed. Free book describes course—tells how you can quickly learn to make excellent income. Write NOW for FREE BOOK. No cost; no obligation; no salesman will call. The School of Real Estate Training, Inc., Dept. 127, 126 Bedford St., Stamford, Conn.

DRAFTING



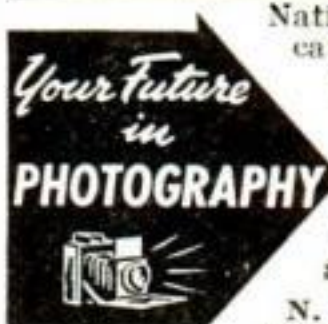
More good jobs now in Drafting. Learn AT HOME in spare time (or at our Chicago School). Send postcard for FREE TRIAL LESSON and see how easy to learn and get a good job.

CHICAGO TECHNICAL COLLEGE
H-216 Tech Bldg., 2000 S. Mich. Ave.
Chicago 16, ILL.

LAW...

STUDY AT HOME Legally trained men win higher positions and bigger success in business and public life. Greater opportunities now than ever before.

More Ability: More Prestige: More Money We guide you step by step. You can train at home during spare time. Degree of LL.B. We furnish all text material, including 14-volume Law Library. Low cost, easy terms. Get our valuable 48-page "Law Training for Leadership" and "Evidence" books FREE. Send for them NOW. LASALLE EXTENSION UNIVERSITY, 417 South Dearborn Street A Correspondence Institution Dept. 783-L Chicago 5, ILL.



Nationwide opportunities, sound postwar career waiting. Photographers needed by newspapers, advertisers, in business, industry, science. N. Y. I. graduates winning success from coast to coast.

Start now. Resident or home study. FREE catalog describes commercial, portrait, motion picture and color courses.

N. Y. INSTITUTE OF PHOTOGRAPHY,
Dept. 5, 10 W. 33 St., New York 1, N. Y.

LEARN MONEY- MAKING CARTOONING

IN SPARE TIME — by Easy Picture Chart Method

Same Simplified Method that has helped train creators of "Terry & Pirates," "Freckles," "Out Our Way," "Winnie Winkle," "Reg'lar Fellers," "Strange As It Seems," "The Neighbors," and many others. Earn while learning. Send 10c for Picture Chart (to test your ability). Samples of successful students, and full details. (State age.)

Landon School of Cartooning, Dept. 4527, Philadelphia 1, Pa.



STUDY AT HOME

With A Chartered Educational Institution

Courses in ENGINEERING: Electrical, Civil, Mechanical, Drafting, Architectural, Steam, Aeronautical, Radio, Structural, Mining, Industrial, Highway, Petroleum, Marine, Chemical. Courses in ARTS AND SCIENCES: Philosophy; Education; Letters; Public Health; Medical Jurisprudence; Psychology; Sociology; Physics; Chemistry; Geology; Pol. Science; Theology; Law; Business and Commerce; Accounting; Mathematics; Statistics; Agriculture. McKinley-Roosevelt Incorporated, 4810-AC, Sheridan Road, Chicago, 40, Illinois

MONEY for MEN ALL DATA FREE

THE PLASTEX Industry needs manufacturers on small scale and for big production of Lamp and Clock Stands, Art Goods and Novelties in Plastex and Marble imitation. Experience unnecessary. 1/2c material makes regular 10c store sellers. Rubber moulds furnished for speed production. Small investment brings good returns. Big chain store orders now being placed. Ambitious men have chance for real prosperity. Our Free booklet will interest and benefit you.

PLASTEX INDUSTRIES, Dept. 2, 1085 Washington Av., New York 58, N.Y.

AUDELS REFRIGERATION & AIR CONDITIONING GUIDE.....\$4

New from Cover to Cover—1280 Pages, Fully Illus. Covering basic principles, servicing, operation & repair of household, commercial & industrial refrigeration & air conditioning. A gold mine of essential important facts for engineers, servicemen, users.

AUDELS CARPENTERS & BUILDERS GUIDES—4 Vols.\$6

A practical illustrated trade assistant on modern construction for carpenters, joiners, builders, mechanics and all woodworkers. 4 vols., 1600 pages, 3700 illustrations, flexible covers. Pocket size. Each volume sold separately \$1.50 a vol.

AUDELS AUTOMOBILE GUIDE.....\$4

A practical quick ready reference book for auto mechanics, service men, operators & owners. Explains theory, construction & servicing of modern motor cars, trucks, buses & auto type Diesel engines. 1540 pages, fully illustrated. 55 chapters. Indexed. A standard book for mechanics. New fluid drive covered.

AUDELS DIESEL ENGINE MANUAL.\$2

A practical, concise treatise with questions and answers on the theory, operation and maintenance of modern diesel engines including General Motors 2 cycle Diesel. 384 pages, fully illus., flexible binding, pocket size. All details plainly brought out, this book is of extreme value to engineers, operators & students.

AUDELS WIRING DIAGRAMS.....\$1

210 Pages. Illustrated. Gives practical facts on wiring of electrical apparatus. It shows clearly how to wire apparatus for practically all fields of electricity. Each diagram is complete & self-explanatory. Highly Endorsed Pocket Companion.

AUDELS PLUMBERS & STEAMFITTERS GUIDES—4 Vols.\$6

A Practical Trade Assistant & Ready Reference. Explains in plain language & by clear illustrations, diagrams, charts, graphs, pictures principles of modern plumbing practice including Marine Pipe Fitting and Air Conditioning. 4 Vols.—1670 Pages—3642 Diagrams. Pocket size. Each Vol. Sold Separately \$1.50 a Vol.

AUDELS SHEETMETAL WORKERS HANDY BOOK.....\$1

Practical inside information. Fundamentals of Sheet Metal Work. 388 pages. Illustrated. 11 sections. Clearly written. Essential & important facts, figures, pointers in everyday language. Ref. Index.

AUDELS SHEETMETAL PATTERN LAYOUTS.....\$4

Developed by Experts for Sheet Metal Workers, Layout Men & Mechanics. A Practical Encyclopedia in 10 Sections, size 7 x 10 x 2—1125 Pages—350 Layouts—1600 Illustrations. 1001 Key Facts. Fully indexed for ready reference in answering your layout problems. Covers all phases of sheet metal work including Pattern Cutting, Pattern Development & Shop Procedure.

AUDELS ANSWERS ON BLUE PRINT READING.....\$2

For Mechanics & Builders. Covers all types of blue print reading including ship & airplane. 376 pages, fully illustrated.

AUDELS NEW MACHINIST & TOOLMAKERS HANDY BOOK....\$4

Covers modern machine shop practice in all its branches. 5 practical books in 1. New from cover to cover. Tells how to set up & operate lathes, screw and milling machines, shapers, drill presses and all other machine tools. 1600 pages, fully illustrated, 5 x 6 1/2 x 2. Indexed. 5 sections. 1—Modern Machine Shop Practice. 2—Blue Print Reading & How to Draw. 3—Calculations & Mathematics for Machinists. 4—Shop Physics. 5—How to Use the Slide Rule. 60 chapters. Easy to read and understand. A shop companion that answers your questions.

AUDELS MATHEMATICS & CALCULATIONS FOR MECHANICS \$2

Mathematics for home study or reference. 700 pages, 550 illus. Practical mathematics from beginning. How to figure correctly. Easy, correct methods covering a complete review. Ill. & Indexed.

AUDELS HANDY BOOK OF PRACTICAL ELECTRICITY.....\$4

For maintenance engineers, electricians & all electrical workers. 1440 Pages, 2600 Illus. Covers important electrical information in handy form—including Marine Wiring, Radio Principles, Welding. Indexed. A Key to a practical understanding of electricity.

AUDELS RADIOMANS GUIDE.....\$4

A key to the practical understanding of radio including Frequency Modulation, Television, etc., Aircraft & Marine Radio. For radio engineers, servicemen, amateurs. 772 pages. 400 Illustrations & Diagrams. Photos. Review Questions & Answers, Reference Index. Authentic, clear, concise.

AUDELS ELECTRONIC DEVICES....\$2

Tells What You Want to Know About Electric Eye. Easily Understood. Covers photo-electric cells & their applications. Amplifiers, illumination, frequencies, voltage, photocell, tubes, Ohm's Law, wiring diagrams, etc.

AUDELS WELDERS GUIDE.....\$1

A concise, practical text on operation & maintenance of all welding machines for all mechanics. Over 400 pages, illustrated. Covers all methods of electric and acetylene welding including airplane work.

AUDEL, Publishers, 49 W. 23 St., N. Y. 10



AN AUDEL GUIDE IS A GOOD FRIEND!

Use the brains and experience of others in these Guides of the Trades. Save time and money with right methods, short cuts, labor saving ideas. CHECK NOW! You can look over any Audel Guide in your home. Start the Easy Payments if satisfied.

----- CUT HERE ----- MAIL ORDER

THEO. AUDEL & CO., 49 W. 23 St., New York 10, N.Y.

Please mail me for 7 days' free examination the books marked (X) below. I agree to mail \$1 in 7 days on each book or set ordered, and to further mail \$1 a month on each book or set ordered until I have paid purchase price.

If I am not satisfied with Guides I will return them.

- | | |
|--|------|
| <input type="checkbox"/> Audels REFRIGERATION & Air Conditioning Guide | \$4. |
| <input type="checkbox"/> Audels PUMPS, HYDRAULICS & AIR COMPRESSORS | 4. |
| <input type="checkbox"/> Audels WELDERS GUIDE | 1. |
| <input type="checkbox"/> Audels BLUE PRINT READING | 2. |
| <input type="checkbox"/> Audels SHEET METAL WORKERS Handy Book | 1. |
| <input type="checkbox"/> Audels SHEET METAL PATTERN LAYOUTS | 4. |
| <input type="checkbox"/> Audels AIRCRAFT WORKER | 1. |
| <input type="checkbox"/> Audels MATHEMATICS and CALCULATIONS | 2. |
| <input type="checkbox"/> Audels MACHINISTS & TOOLMAKERS Handy Book | 4. |
| <input type="checkbox"/> Audels DIESEL ENGINE MANUAL | 2. |
| <input type="checkbox"/> Audels MECHANICAL Dictionary | 4. |
| <input type="checkbox"/> Audels AUTOMOBILE GUIDE | 4. |
| <input type="checkbox"/> Audels MARINE ENGINEERS Handy Book | 4. |
| <input type="checkbox"/> Audels SHIPFITTERS Handy Book | 1. |
| <input type="checkbox"/> Gueths MECHANICAL DRAWING COURSE | 1. |
| <input type="checkbox"/> Rogers DRAWING and DESIGN | 2. |
| <input type="checkbox"/> Audels MILLWRIGHTS and Mechanics Guide | 4. |
| <input type="checkbox"/> Audels CARPENTERS and Builders Guides (4 vols.) | 6. |
| <input type="checkbox"/> Audels PLUMBERS and Steamfitters Guides (4 vols.) | 6. |
| <input type="checkbox"/> Audels MASONS and Builders Guides (4 vols.) | 6. |
| <input type="checkbox"/> Master PAINTER and DECORATOR | 2. |
| <input type="checkbox"/> Audels GARDENERS & GROWERS GUIDES (4 vols.) | 6. |
| <input type="checkbox"/> Audels ENGINEERS and Mechanics Guides | |
| Nos. 1, 2, 3, 4, 5, 6, 7 and 8 complete | 12. |
| <input type="checkbox"/> Audels Answers on Practical ENGINEERING | 1. |
| <input type="checkbox"/> Hawkins Aids to ENGINEERS EXAMINATION | 2. |
| <input type="checkbox"/> Audels WIRING DIAGRAMS | 1. |
| <input type="checkbox"/> Audels Handy Book of PRACTICAL ELECTRICITY | 4. |
| <input type="checkbox"/> Audels ELECTRICAL POWER CALCULATIONS | 2. |
| <input type="checkbox"/> Hawkins ELECTRICAL Guides at \$1. each | 10. |
| <input type="checkbox"/> Audels ELECTRONIC DEVICES | 2. |
| <input type="checkbox"/> Audels ELECTRIC Dictionary | 2. |
| <input type="checkbox"/> Audels RADIOMANS GUIDE | 4. |
| <input type="checkbox"/> Audels NEW ELECTRIC LIBRARY at \$1.50 a Volume | |
| Vols. I, II, III, IV, V, VI, VII, VIII, IX, X, XI, XII. | |

Name.....

Address.....

Occupation.....

Employed by..... PSM

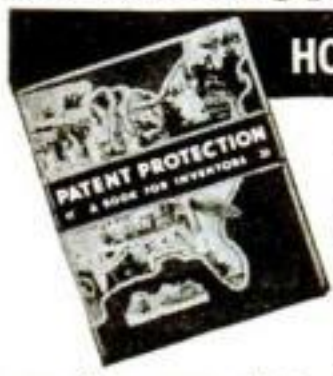
Important
PATENT
Information

FREE

to
SERIOUS-MINDED

INVENTORS

Information you can depend upon is packed into these two big books written to help ambitious inventors like you cash-in on your ideas . . . two big books that have helped thousands of inventors by showing them what to do to secure a strong patent.



HOW to PATENT your INVENTION

Here is sound information you will need before making one move! Everything is explained in detail . . . step by step. In addition, book contains diagrams of 115 Mechanical Movements—just what you may now need to complete your invention. A valuable book . . . and FREE. Use the coupon below.



HOW TO SELL YOUR INVENTION

"When and How to Sell Your Invention" points out necessary procedures when you are ready to commercialize your invention. A book of suggestions based on our 47 years' dealings with inventors. It's FREE . . . send the coupon today.

Valuable "EVIDENCE of INVENTION" Form



GET
ALL 3
FREE . . .
Now!

This form contains space for properly submitting rough sketch and necessary details of your invention. You'll want it if you are seriously interested in patenting your idea. It's FREE for the asking.

Fill in and mail the coupon now. Read the books . . . then, if you feel you have a patentable invention, GET STARTED NOW!

VICTOR J.
EVANS & Co.

Registered Patent Attorneys for Nearly 50 Years
940-H Merlin Bldg., Washington 6, D. C.
Please send me your books—"Patent Protection" and "When and How to Sell Your Invention"—also important "Evidence of Invention" form, without cost or obligation.

Name _____
Address _____
City and State _____

Buy War Savings Bonds and Stamps regularly.

KEEP YOUR EYE ON THE JOB AHEAD!



If others are getting promotions and you are not, don't discount your ability. There is an easily applied remedy that will bring you to the attention of the top men in your plant.

How to acquire this ability is the subject of a 48 page booklet that is yours for the asking.

It tells how natural ability can be combined with a knowledge of shop practice plus training in the art of handling people. These talents win key positions in industry.

Write to Louis S. Vosburgh
LINCOLN EXTENSION INSTITUTE, INC.
1401C West 75th Street Cleveland 2, Ohio

MECHANICAL ENGINEERING PAYS!

This is the machine age. And back of every machine—every part—are the engineers who designed it, the trained mechanics who built it. No wonder there's high pay . . . many opportunities to advance . . . for these indispensable men. Be one of them! Don't stick in a rut! Let I.C.S. show you the way to success! These Schools, famous for more than 50 years, offer authoritative, practical Courses to meet the needs of almost any man in mechanical trades. Mechanical Engineering . . . Drafting . . . Mechanical Drawing . . . Shop Practice. Write today for free booklet.

International Correspondence Schools, Box 7626-L, Scranton 9, Pa.



You can learn plain, rapid writing or fancy ornamental writing for social and business advancement, right in your own home during spare time by my Simplified Method. Write for my free book, "How to Become an Expert Penman," which shows what others have accomplished by taking my Courses. Send 10c for one of my favorite Pen Points and your name with a beautiful flourished bird written on a card. Write today.

T. M. TEVIS, BOX 25R, CHILLICOTHE, MO.

BOOKS FOUND FREE!

What books do you want?

Lowest market prices on all books. No charge for locating old books.
HARD-TO-FIND or OUT-OF-PRINT
SEARCHLIGHT BOOK CENTRE 22 East 17th St. New York City 3

DEVELOP THE POWERFUL INFLUENCE
FEUCHTINGER Method Guaranteed
IN YOUR VOICE
DO IT YOURSELF AT HOME
Write for the Voice Book FREE
Sent only to those over 17yrs of age
PERFECT VOICE INSTITUTE
STUDIO 136-B Kimball Hall Bldg., Chicago 4, Ill.

New Designs in FRANZITE GRIPS

Modernize Your Gun! Improve Your Score!
Most durable grips made. Positively unbreakable! For Colt, Smith & Wesson, Hi-Standard. Ortgies, Luger & Mausers in a wide choice of beautiful designs in ivory, pearl, walnut, onyx, etc. Low prices. FREE CATALOG. Dealers Wanted.
SPORTS, INC., (Mfrs.) 5501 Broadway, Dept. S-7, Chicago 40, Ill



LEARN PORTRAIT PAINTING AT HOME

• Under unique Stuart System men and women with no known talent, paint exact oil or charcoal likenesses. Study the evidence in new 42-Portrait Brochure of samples. Many earn while learning. Book is free on request.
121 Monument Circle, Room 287, Indianapolis 9, Ind.
Please send me free book and outline of lessons.

Name _____
Street _____
City _____ State _____

Get into the **GOOD PAY** **BIG** **OPPORTUNITY** **FIELD OF...** **RADIO** **ELECTRONICS**



A "LEARN-BY-DOING" EXPERIMENTS

YOU MAKE 133 FASCINATING EXPERIMENTS WITH THE USE OF 8 BIG KITS OF RADIO PARTS AND ASSEMBLIES



Build modern Radio Receiving Circuits that operate, right in your own "Home Laboratory." Build Electric Eye Devices, an Aviation Band Circuit, a Public Address System, a Wireless Microphone unit—and work out numerous other fascinating practical Radio and Electronic experiments . . . all in your own home, in your spare time.

B 90 "SYNCHRO-GRAPHIC" LESSON TEXTS*

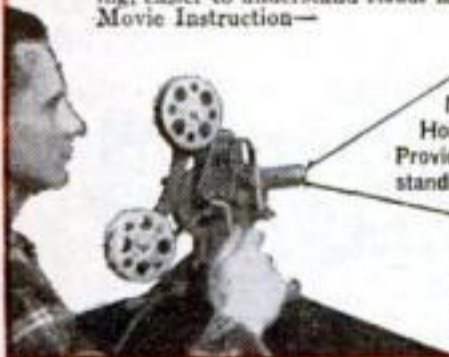


You get 90, well-illustrated lessons prepared under the supervision of Dr. Lee DeForest, the "Father of Radio," inventor of the Audion Tube, and holder of over 300 important patents.

*All lesson diagrams and charts are printed on sheets that fold out—keeping illustrations constantly synchronized to text. This valuable DeForest's "Synchro-Graphic" feature speeds your progress by eliminating frequent flipping of pages to refer back or ahead to illustrations mentioned in text.

C "LEARN-BY-SEEING" MOVIES AT HOME

To help you master important Radio fundamentals, you use the more interesting, easier to understand visual method of Movie Instruction—



No Other Home Training Provides This Outstanding Advantage.

YOU GET THE USE OF A GENUINE DEVRY PROJECTOR AND SPECIALLY PREPARED RADIO AND ELECTRONIC TRAINING FILMS

SEE RADIO CIRCUITS IN ACTION—ELECTRONS ON THE MARCH!

DeFOREST'S TRAINING, INC.
CHICAGO 14, ILLINOIS

Cash in on the big opportunities for good pay, which the Radio-Electronics Industry offers now and after the war! Get started today towards a bright and profitable future in this fast-moving billion dollar field. Prepare now to start a business of your own, or for one of the many positions in FM Radio, Broadcast Radio, Electronics, Communications, Motion Picture Sound, etc.

DEFOREST OFFERS YOU THE MODERN "A-B-C" WAY

No other Radio-Electronics training provides all three important, basic A-B-C Training Aids at home. With DeForest's you use (A) 8 big kits of Radio Parts and Assemblies to make 133 fascinating, helpful experiments, (B) 90 "Synchro-Graphic" lesson texts, prepared under the supervision of Dr. Lee DeForest, the "Father of Radio," and inventor of the Audion Tube, (C) Use of a genuine DeVry 16mm. Movie Projector and specially prepared training films to help you learn Radio-Electronic fundamentals the visual way—proved faster, easier, more understandable. DeForest's offers all this PLUS effective Employment Service which helps you get started in this fast moving, opportunity industry of the future!

MAIL COUPON FOR COMPLETE INFORMATION

Let us show you how DEFOREST'S TRAINING can help YOU prepare for a Good-Pay Job or Business of Your Own. See how YOU can learn Radio-Electronics, DeForest's modern A-B-C way, in your spare time at home . . . how YOU can prepare now for the many opportunities the Radio Electronics industry offers the trained man! DeForest's Training can help YOU just as it has helped others year after year. Mail the coupon today for more complete information, including a free copy of the big book "Victory for You!" and Equipment Folder



DEFOREST'S TRAINING INCLUDES INSTRUCTION IN MOTION PICTURE SOUND EQUIPMENT, FM RADIO AND TELEVISION . . . RESIDENTIAL TRAINING IN OUR MODERN CHICAGO LABORATORIES ALSO AVAILABLE—ASK US FOR INFORMATION!

E. B. DeVry, President
DeFOREST'S TRAINING, INC.
2535-41 North Ashland Avenue, Dept. PS-B7
Chicago 14, Illinois, U.S.A.

Please send me your "VICTORY FOR YOU!" BOOK and EQUIPMENT FOLDER



Name _____ Age _____

Address _____

City _____ Zone _____ State _____

☐ If under 16, check here for special information.

☐ If a veteran of World War II, check here.

It's YOUR future—Make the most of it!



Start now to earn the bigger pay in electrical repair

in electrical maintenance and repair—and at top-notch wages? Are you ready—with experience and ability—to cash in on it? Others are getting just the sort of background needed—quick! practical!—to handle the great variety of electrical maintenance and repair work TODAY—from this well-known electrical library. You can too!

THE LIBRARY OF ELECTRICAL MAINTENANCE AND REPAIR

5 vols., 1826 pages, 1724 illustrations

Gives you the "know-how" to tackle any wiring or motor job. Five books show you HOW—to install all types of motor and generator units—to inspect and repair motor starters and generators—to diagnose motor and generator troubles—to figure new windings for old cores—DC and AC windings—to test armature windings—test induction motors, etc., etc. One book is full of trouble-shooting charts that show quickly symptoms, causes, specific remedies, etc.

Take the first step toward improving YOUR future—Mail this coupon TODAY

No money down—special price—easy payments—FREE trial

McGraw-Hill Book Co., 330 W 42 St., New York 18, N. Y.

Send me for ten days' free examination the Electrical Maintenance and Repair Library. If satisfactory I will send you \$1.00 in 10 days and \$2.00 monthly until the price of \$15.00 is paid. If not wanted I will return books postpaid. (To insure prompt shipment write plainly and fill in all lines.)

Name.....
Home Address.....
City and State.....
Company.....
Position..... PSM 7-45

AVIATION Career

DON'T WAIT UNTIL THE WAR IS OVER!

Since 1929 Cal-Aero Technical Institute has been specializing in modern, progressive training for Aeronautical Engineers and Master Aviation Mechanics. Prepare now for your Aviation Career. BE READY! Opportunities are great today and will be greater in tomorrow's Age of Flight. **DISCHARGED VETERANS**—Write us about Aviation Training as provided under "G. I. Bill of Rights."



CAL-AERO TECHNICAL INSTITUTE
MAJOR C. C. MOSELEY PRES. SINCE 1929
FORMERLY CURTISS-WRIGHT TECHNICAL INSTITUTE

GRAND CENTRAL AIRPORT
GLENDALE 1, CALIFORNIA
(LOS ANGELES COUNTY)

MAIL THIS COUPON TODAY!

Cal-Aero Technical Institute, Grand Central Airport, Glendale 1, California. Send information and illustrated catalogue on Aviation Training. FREE... without obligation... Dept. PS-7

Name..... Birth Date.....
Street.....
City..... State.....

Learn to Service and Repair ELECTRICAL APPLIANCES

Learn to be a service mechanic on all types of electrical appliances... and prepare now for a permanent future, independence and security, operating a business of your own. You won't have to worry about losing your job when the next depression comes if you have your own electrical appliance repair business. There is always a demand for repair work... and it can't be done by a machine. Our practical, easy to learn home-training teaches you how to repair washing machines, vacuum cleaners, stoves, lamps, motors, irons, etc., and how to do house wiring. Also how to start your own business on little capital. Write today for FREE illustrated booklet which will explain in detail. No obligation. No salesmen will call.

PACIFIC TRAINING SCHOOL

4701 W. Pico, Dept. AS-7, Los Angeles 6, California

HIGH SCHOOL AT HOME

Most well-paid positions demand high school training. Without it, or equivalent, you can't advance to the full extent of your abilities in any trade, business or profession. Whatever your age, however you're situated, IT ISN'T NECESSARY TO STRUGGLE UNDER THAT HANDICAP. I.C.S., famous for more than 50 years, enables you to start your own high school in your own home. You're in a class by yourself—study in your spare time—acquire a high school education at astonishingly low cost. Authoritative texts! Rapid Progress! Write today for free booklet.

International Correspondence Schools, Box 7626-L, Scranton 9, Pa.

Big Money for Workers In Home or Shop



Licensed Concrete Specialists wanted. No experience needed. Make Colorglazed concrete pottery without molds. New, lost cost, patented method. Cemetery products, novelties, tiles, floors, etc. Basement leaksealing. Other big pay projects. Booklet, details free. Men only.

NATIONAL POTTERIES COMPANY

542 West Lincoln, Fergus Falls, Minnesota

STUDY ENGINEERING AT HOME

With A Chartered Educational Institution

Courses in **ENGINEERING**: Electrical, Civil, Mechanical, Drafting, Architectural, Steam, Aeronautical, Radio, Structural, Mining, Industrial, Highway, Petroleum, Marine, Chemical. Courses in **ARTS AND SCIENCES**: Philosophy; Education; Letters; Public Health; Medical Jurisprudence; Psychology; Sociology; Physics; Chemistry; Geology; Pol. Science; Theology; Law; Business and Commerce; Accounting; Mathematics; Statistics; Agriculture. McKinley-Roosevelt Incorporated, 4610-BC, Sheridan Road, Chicago 48, Illinois

REFRIGERATION

Repair and adjust all refrigerators. New manual tells how. Charts and pictures to help you. Price only \$1. postpaid. Money back guarantee. Supreme Publications, 9 S. Kedzie Ave., Chicago 12, ILL.



Begin today. Write now for our Free Book, "How to Become a Good Penman," it contains specimens and tells how others learned to write in spare time. Enclose 10c for your name beautifully written and a pen point suitable for shaded writing. Write today. THE TAMBLYN SCHOOL OF PENMANSHIP, N-439 Ridge Building, Kansas City, Mo.



Fix Your Own ALARM CLOCKS

New, practical home course. Just out. Makes interesting hobby—profitable too. Save money by doing your own repairing at home. Easy if you know how. Price now only \$1.00. Details FREE. Send postcard. THIES JEWELRY STORE, Genoa 5, Illinois

Store Route Plan PAYS BIG MONEY

SELL COUNTER CARD PRODUCTS

Build a good-paying business of your own. Call on dealers of all kinds; show nationally-advertised Aspirin, Vitamins, Cosmetics and 200 other necessities. Big 5c and 10c retail packages, high quality. Attractive counter displays sell goods fast. Free book gives amazing facts. Write!

World's Products Co., Dept. 83-K, Spencer, Ind.



GET INTO RADIO

TELEVISION ELECTRONICS NOW!

This amazing new shop instruction system gives you actual experience with a Home Radio Laboratory—part of the



You build this complete, modern super-heterodyne receiver with the equipment that comes with your National Training at no extra cost.

SHOP METHOD HOME TRAINING

FOR YOU—A REAL HOME LABORATORY IN MODERN RADIO

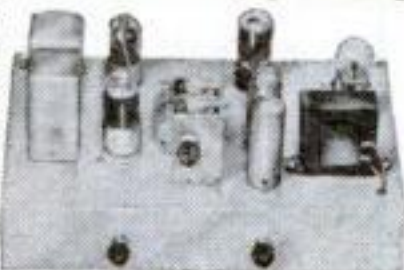
from one of the world's best established Oldest and Largest Technical Trade Schools



Your National Training Kits include equipment for hundreds of practical electronic experiments in your own home. You have the

genuine parts for this audio oscillator which you get to understand by building it yourself.

You learn modulation, beat frequencies, signal generation by actually building this small radio transmitter with your National shop parts.



Your training outfits from National are made up of the most modern radionic equipment—much of it just out of the experimental laboratory. You learn new ways of handling equipment by modern methods. Get the details by mailing the coupon.

ods. Get the details by mailing the coupon.

Send the coupon below, immediately. Learn how this **sensationally improved**, practical speed-up training can fit you, in a short time, for the **GREAT BUSINESS OF RADIO**—for the **NEW AND RAPIDLY EXPANDING FIELD OF FREQUENCY MODULATION (F.M.), TELEVISION AND ELECTRONICS**.

This is the thoroughly proved, quick and easy speed-up method used so extensively in wartime training—endorsed by the **success of National men everywhere**—a system by which you study in spare time—off hours, even minutes right in your home and yet have the **ADVANTAGE OF REAL SHOP EXPERIENCE** to back you up.

Trained Radio Men Wanted

The man who really **knows modern Radio** is in greater demand today than ever before—not only in Radio proper but in Television and Electronics—in Aviation, Transportation, Communica-

tions. **Good jobs are wide open, WAITING FOR YOU**, in the production, operation and maintenance of modern electronic equipment—in radio stations, in hundreds of industries—in homes, theatres and studios. Good, sound training in this important field is absolutely necessary. And now, National Schools brings such training to you **no matter where you live or what you may be doing**—not only the fundamental theory but the **actual experience that comes with knowing shop practice and working with real equipment**—demonstrating each step with first-hand knowledge. This is true **"learning by doing"**—direct from the great shops and laboratories of National Schools where new developments in methods, equipment and applications are constantly going forward.

Only National can offer you such practical training because only National has the plant to back it up. **Sample this training yourself. MAIL THE COUPON FOR A FREE LESSON.**

POSTWAR SUCCESS and SECURITY FOR YOU

Radio is a Big Sound, Well-Established Business. **Television is just on the threshold of limitless expansion.** When you hang up your uniform—when your war job folds up, will you step out proudly into an essential established industry? Perhaps into a business of your own? Answer these questions by reading the catalog sent you **FREE** from National Schools. **Face realities now! Fill out and mail the coupon today.**

Check the Job You Now Have With These Opportunities in RADIO

1. **Financial Security** Radio has grown from \$100 million to \$5 billion in past few years.
2. **Limitless Future** predicted by over 1,800 manufacturers of equipment.
3. **Television promises** over half a million jobs alone—experts estimate.
4. **Electronics opens** wide new fields in home and industrial use.
5. **Your Own Business** with little or no capital.

Get the details. Use the coupon!

FREE GET THESE 2 BIG BOOKS



NATIONAL SCHOOLS

LOS ANGELES 37, CALIFORNIA EST 1905

MAIL OPPORTUNITY COUPON FOR QUICK ACTION

National Schools, Dept. 7-PS
4000 South Figueroa Street
Los Angeles 37, California

(Mail in envelope or paste on penny post card)

Mail me **FREE** the books mentioned in your ad including a sample lesson of your course. I understand no salesman will call on me.

NAME.....AGE.....

ADDRESS.....

CITY.....STATE.....

Include your zone number

NATIONAL TRAINING WINS BIG JOBS

You, too, can share the success of National graduates. Joseph Grumich, Lake Hiawatha, N. J., writes: "My latest offer was for \$5,800.00 as Radio Photo Engineer, but I am doing well where I am. I am deeply indebted to National."



While still a student of National training, I. Wilson of Vallejo, California, writes: "My pay has jumped from \$52.18 a week to \$72.65, and the end is not in sight. I am proud of my National Course."

Joseph Michel, Jr., Granite City, Illinois, writes: "I am enthused with National training. I am now earning \$225 a month as a radio operator and technician and \$20 a week more in my shop at home."

QUICK WAY TO LEARN MUSIC

—play any instrument

GET A REAL thrill out of music! Play the musical instrument you like best. Start right in with simple tunes. No tedious, old-fashioned drills and exercises.

It's easy! Everything is in print and picture. You see every position and move. Thousands have been amazed at their progress in just a few short weeks. Now they're sought-after guests for every party! Don't miss out on the popularity that is rightfully yours!

Mail coupon today for free illustrated Booklet and Print and Picture sample that show how easily and quickly you can learn music at home. Just check instrument that interests you in coupon below. U. S. School of Music, 87 Brunswick Bldg., New York 10, N. Y.



**SUCCESSFUL
47TH YR.**

FREE PRINT and PICTURE SAMPLE

U. S. School of Music, 87 Brunswick Bldg., New York 10, N. Y.

Please send me Free Booklet and Print and Picture Sample. I would like to play instrument checked below. (Do you have instrument.....)

Piano	Accordion	Trumpet	Ukulele
Guitar	Saxophone	Tenor Banjo	Clarinet
Violin	Mandolin	Cornet	Other Instrument

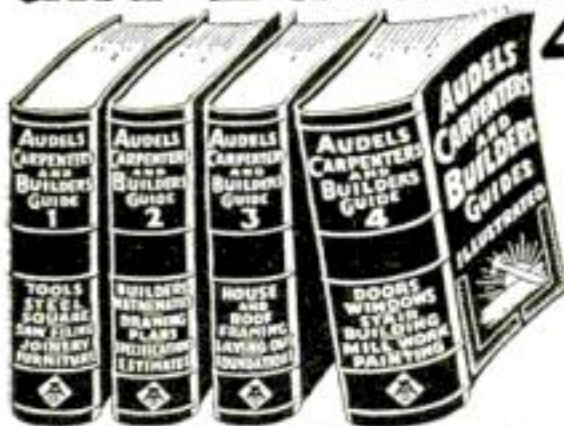
Name.....
(Please Print)

Street.....

City..... State.....

AUDELS Carpenters and Builders Guides

4 vols. \$6



Inside Trade Information for Carpenters, Builders, Joiners, Building Mechanics and all Woodworkers. These Guides give you the short-cut instructions that you want—including new methods, ideas, solutions, plans, systems and money saving suggestions. An easy progressive course for the apprentice and student. A practical daily helper and Quick Reference for the master worker. Carpenters everywhere are using these Guides as a Helping Hand to Easier Work, Better Work and Better Pay. To get this assistance for yourself, simply fill in and mail the FREE COUPON below.

Inside Trade Information On:

How to use the steel square—How to file and set saws—How to build furniture—How to use a mitre box—How to use the chalk line—How to use rules and scales—How to make joints—Carpenters arithmetic—Solving mensuration problems—Estimating strength of timbers—How to set girders and sills—How to frame houses and roofs—How to estimate costs—How to build houses, barns, garages, bungalows, etc.—How to read and draw plans—Drawing up specifications—How to excavate—How to use settings 12, 13 and 17 on the steel square—How to build hoists and scaffolds—skylights—How to build stairs—How to put on interior trim—How to hang doors—How to lath—lay floors—How to paint



THEO. AUDEL & CO., 49 W. 23rd St., New York City

Mail Audels Carpenters and Builders Guides, 4 vols., on 7 days' free trial. If O.K. I will remit \$1 in 7 days, and \$1 monthly until \$6 is paid. Otherwise I will return them. No obligation unless I am satisfied.

Name.....

Address.....

Occupation.....

Reference..... PSM

Buy War Savings Bonds and Stamps regularly.

TRAIN FOR KEY JOB OR BUSINESS OF YOUR OWN

REFRIGERATION and AIR CONDITIONING

Millions of Older Units Need Expert Service. Big After-the-War Expansion Will Create Even More Opportunities. Approved for Veterans "G. I." Training

A key job—a successful business of your own—you can have either in this vital, war-hit industry. A serious shortage of service-experts exists in every branch. Big post-war boom will open thousands of new opportunities. Get ready for your big chance. We'll give you the practical training you need—at home—and in our big Chicago shops, largest and most completely equipped in the country. No advanced schooling needed. Our unique methods make everything easy to grasp. We've trained thousands. Pay as you go. Quit when you want to. Get the full facts without obligation. Write TODAY.

INDUSTRIAL TRAINING INSTITUTE

2150 Lawrence Avenue, Dept. P2G, Chicago 25, Ill.

BECOME AN EXPERT ACCOUNTANT

Executive Accountants and C. P. A.'s earn \$2,000 to \$10,000 a year. Thousands of firms need them. About 20,000 Certified Public Accountants in the U. S. We train you thoroughly at home in spare time for C. P. A. examinations or executive accounting positions. Previous experience unnecessary. Personal training under supervision of staff of C. P. A.'s, including members of the American Institute of Accountants. Write for free book, "Accountancy, the Profession That Pays."

LASALLE Extension University, 417 So. Dearborn St.
A Correspondence Institution Dept. 783-H Chicago 5, Ill.

PRE-RADAR TRAINING

Prepare before induction or enlistment for U. S. Navy Radio Technician training offered only to qualified men. 12-week course in math, electricity, radio; begins July 9. 4,000 Navy men received pre-radar training here. Write—state age, education.

BLISS ELECTRICAL SCHOOL
107R Takoma Ave., Washington 12, D.C.



It's so important to write a good hand for business and social advancement. Poor illegible penmanship often causes costly errors and marks you for failure. Why write a poor hand? It's so easy to learn at home in spare time. Write for our new free booklet today. If you wish, send 10c for a penpoint suitable for shaded writing and your name beautifully written.

THE TAMBLYN SCHOOL OF PENMANSHIP
In Business Since 1895 H-439 Ridge Bldg., Kansas City, Mo., U.S.A.

DO YOU

WANT a permanent business profession of your own? Then become a foot correctionist. Earnings of men and women in this greatly needed profession run as high as \$50.-\$100. weekly after a few weeks home training—not medical or chiropody—easy terms, no further capital needed, no goods to buy. 50th year. Write for free booklet.

Stephenson System of Foot Correction, 62 Back Bay, Boston, Mass.

WINDOW SIGN LETTERS

For Store Fronts and Office Windows. Anyone can put them on. Samples furnished. Genuine gold and silver.

METALLIC LETTER CO., 441 N. Clark, Chicago 10

Learn BAKING At Home

Baking is one of America's high industries in wages. Nearly depression-proof. Thorough basic home course lays sound foundation. If you have aptitude, write for FREE BOOKLET, "Opportunities in Commercial Baking."

National Baking School, 1315 Mich. Ave., Dept. 136-B, Chicago 5

New OTTAWA WOOD SAW



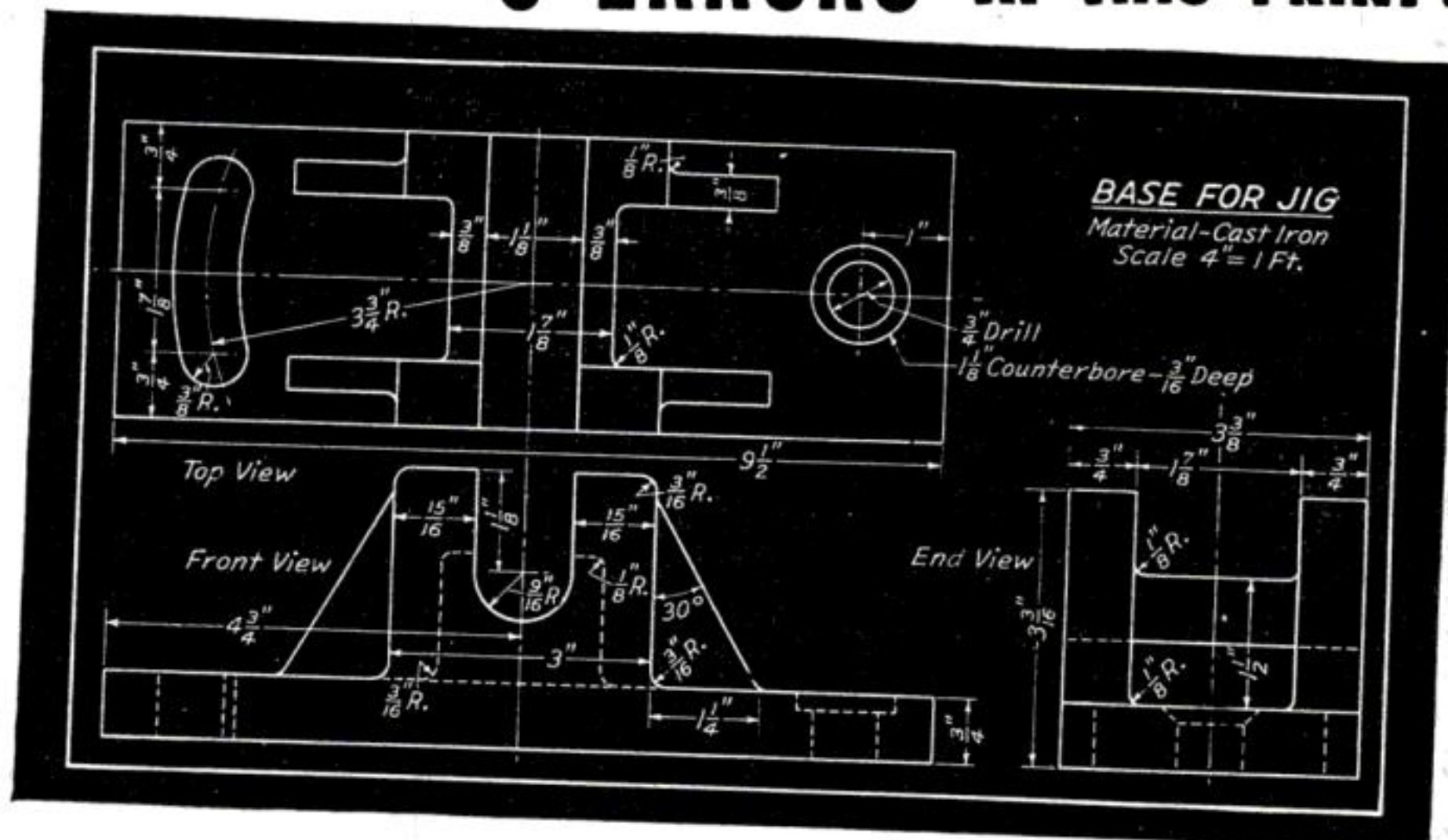
For Tractors

—Makes wood sawing fast and easy. Can cut enough wood to pay for itself quickly. Easily moved while attached. Big heavy blade. FREE details.

OTTAWA MFG. CO.

W-701 Oak Ave., Ottawa, Kans.

CAN YOU FIND 5 ERRORS IN THIS PRINT?



SOME errors in this print are obvious. But only a **TRAINED MAN** can find all of them!

It takes a **TRAINED MAN**, too, to "cash in" on today's opportunities in **DRAFTING**!

International Correspondence Schools Courses in Architectural and Mechanical Drafting are prepared by outstanding, practical authorities, and revised to keep them

up-to-date. They offer **YOU** a way to prepare yourself for a bigger, better paying position during your leisure time.

In all, I. C. S. offers courses in 400 business and industrial subjects. Texts are profusely illustrated for **CLARITY**. Instruction is **PERSONAL** and **FLEXIBLE**. Mail the coupon for complete information — **NOW!**

INTERNATIONAL CORRESPONDENCE SCHOOLS



BOX 7624-L, SCRANTON 9, PENNA.

Without cost or obligation, please send me full particulars about the course *before* which I have marked X:

- ☐ **Air Conditioning and Plumbing Courses**
- ☐ Air Conditioning
- ☐ Heating ☐ Plumbing
- ☐ Refrigeration ☐ Steam Fitting
- ☐ **Chemistry Courses**
- ☐ Chemical Engineering
- ☐ Chemistry, Analytical
- ☐ Chemistry, Industrial
- ☐ Chemistry, Mfg. Iron & Steel
- ☐ Petroleum Refining ☐ Plastics
- ☐ Pulp and Paper Making
- ☐ **Civil Engineering, Architectural and Mining Courses**
- ☐ Architectural Drafting
- ☐ Architecture
- ☐ Bridge and Building Foreman
- ☐ Building Estimating
- ☐ Civil Engineering ☐ Coal Mining
- ☐ Contracting and Building
- ☐ Highway Engineering
- ☐ Lumber Dealer
- ☐ Reading Structural Blueprints
- ☐ Sanitary Engineering
- ☐ Structural Drafting
- ☐ Structural Engineering
- ☐ Surveying and Mapping

- ☐ **Electrical Courses**
- ☐ Electrical Drafting
- ☐ Electrical Engineering
- ☐ Power House Electric
- ☐ Practical Electrician
- ☐ Practical Telephony
- ☐ Telegraph Engineering
- ☐ **Internal Combustion Engines Courses**
- ☐ Auto Technician ☐ Aviation
- ☐ Diesel-Electric
- ☐ Diesel Engines ☐ Gas Engines
- ☐ **Mechanical Courses**
- ☐ Aeronautical Engineering
- ☐ Airplane Drafting
- ☐ Flight Engineer
- ☐ Foundry Work
- ☐ Heat Treatment of Metals
- ☐ Industrial Engineering
- ☐ Industrial Metallurgy
- ☐ Mechanical Drafting
- ☐ Mechanical Engineering
- ☐ Mold-Loft Work
- ☐ Patternmaking
- ☐ Reading Shop Blueprints
- ☐ Sheet-Metal Drafting
- ☐ Sheet-Metal Worker

- ☐ Ship Drafting
- ☐ Ship Fitting
- ☐ Shop Practice
- ☐ Steel Mill Workers
- ☐ Tool Designing
- ☐ Welding, Gas and Electric
- ☐ **Radio Courses**
- ☐ Electronics
- ☐ Radio, General
- ☐ Radio Operating
- ☐ Radio Servicing
- ☐ **Railroad Courses**
- ☐ Air Brake ☐ Car Inspector
- ☐ Locomotive Engineer
- ☐ Locomotive Fireman
- ☐ Railroad Section Foreman
- ☐ **Steam Engineering Courses**
- ☐ Boilermaking
- ☐ Combustion Engineering
- ☐ Engine Running
- ☐ Marine Engineering
- ☐ Steam Electric
- ☐ Steam Engines
- ☐ **Textile Courses**
- ☐ Cotton Manufacturing
- ☐ Rayon Weaving

- ☐ Textile Designing
- ☐ Woolen Manufacturing
- ☐ **Business and Academic Courses**
- ☐ Accounting ☐ Advertising
- ☐ Arithmetic ☐ Bookkeeping
- ☐ Business Correspondence
- ☐ Business Management
- ☐ Certified Public Accounting
- ☐ College Preparatory
- ☐ Commercial
- ☐ Cost Accounting
- ☐ Federal Tax
- ☐ First Year College
- ☐ Foremanship
- ☐ French
- ☐ Good English
- ☐ High School
- ☐ Higher Mathematics
- ☐ Illustrating
- ☐ Motor Traffic
- ☐ Postal Service
- ☐ Salesmanship
- ☐ Secretarial
- ☐ Sign Lettering ☐ Spanish
- ☐ Stenography
- ☐ Traffic Management

Name.....Age.....Home Address.....
City.....State.....Present Position.....Working Hours.....A.M. to.....P.M.

Canadian residents send coupon to International Correspondence Schools Canadian, Ltd., Montreal, Canada.

British residents send coupon to I. C. S., 71 Kingsway, London, W. O. 2, England.

DISCOUNT TO DISCHARGED VETERANS—SPECIAL TUITION RATES FOR MEMBERS OF THE ARMED FORCES

Do you want

→ ..to go to College?

→ ..or to enter a Profession?

(Such as Accounting, Architecture, Nursing, Dentistry, Teaching, Social Work, Osteopathy, Beauty Culture, Optometry, Embalming, Chiropody, Law, Medicine, etc.)

→ ..or get an Office Position?

To get anywhere, you practically **MUST** finish High School **FIRST**. You can complete our simplified High School Course in **SPARE** time at home, as **FAST** as your time and abilities permit. Equivalent to resident school work—prepares you for college, pre-professional examinations, business, industry. Standard texts furnished. Diploma. Credit for H.S. subjects already completed. Single subjects if desired. Low tuition, easy terms. American School, Chicago, est. 1897—endorsed by educators. Finish your high school education **NOW**. Write **TODAY!**

High School Course at Home

Many Finish in 2 Years

American School, Dept. HB46, Drexel Ave. at 58th St., Chicago 37

Gentlemen: Send me **FREE** information covering special training in subjects checked below. No obligation on my part.

- | | |
|--|--|
| <input type="checkbox"/> High School Course | <input type="checkbox"/> Diesel Engineering |
| <input type="checkbox"/> Cost Accounting for Mfg. | <input type="checkbox"/> Drafting and Design for Men and Women |
| <input type="checkbox"/> Architecture and Building | <input type="checkbox"/> Plastics |
| <input type="checkbox"/> Automotive Engineering | <input type="checkbox"/> Private Secretary |
| <input type="checkbox"/> Business Management | <input type="checkbox"/> Mechanical Engineering |
| <input type="checkbox"/> Electrical Engineering | <input type="checkbox"/> Aviation <input type="checkbox"/> Radio |
| <input type="checkbox"/> Elec. and Gas Refrigeration | <input type="checkbox"/> Salesmanship |
| <input type="checkbox"/> Air Conditioning | <input type="checkbox"/> Shipbuilding |
| <input type="checkbox"/> Railway Training | |

Name

Address

START NOW TOWARD A FUTURE IN REFRIGERATION and AIR CONDITIONING

Refrigeration and Air Conditioning are among the giant industries of America. Such industries need men who **KNOW**. Many men servicing and installing equipment are making large incomes.

Spare Time Training for your Post-War future

Get the know-how now so that you can qualify for experience installing and servicing Refrigeration and Air Conditioning in the stores, offices, homes, etc.

With proper training and experience, you should be able to get started in these great industries or develop a Refrigeration and Air Conditioning business for yourself—installing, servicing and maintaining equipment. There's money in it—and **INDEPENDENCE**.



Rush Coupon Below Today!

Practical Interesting Training

You'll like our way of training—through capable home-study instruction followed by practice on actual equipment under watchful eyes of seasoned Refrigeration and Air Conditioning men in our shops. You'll get top-rate instructions—the easy way. So **get the facts now—FREE** of obligation. Write **TODAY—SURE!**

GET VALUABLE FACTS FREE

UTILITIES ENGINEERING INSTITUTE, Dept. 375
1314 W. BELDEN AVE., CHICAGO 14, ILL.

Please send me the Free **FACTS** about opportunities in Air Conditioning and Mechanical Refrigeration. I marked the one that interests me most.

☐ Air Conditioning ☐ Mechanical Refrigeration

NAME..... Age.....

ADDRESS.....

CITY..... Zone..... STATE.....

LEARN SPANISH

FRENCH, GERMAN or ITALIAN

The way you learned English . . . by listening to it spoken, in your home! **LANGUAGE PHONE** record course makes any language as easy as learning a tune on your phonograph.

FREE 7-DAY TRIAL!

For Booklet write **LANGUAGE PHONE**, Dept. PS2, 354 Fourth Ave., N. Y. 10.

LANGUAGE-PHONE

YOU CAN ADVANCE IN PLASTICS!

Plastics can be the next great industry . . . expanding as swiftly and largely as the automotive, radio and aviation businesses. Already, it is an important industry and a growing one. With I. C. S. training, you can take advantage of the many opportunities in Plastics today. At the same time, you prepare for the vast possibilities of tomorrow. Write for the free booklet containing full information! Do it right now! International Correspondence Schools, Box 7626-L, Scranton 9, Pa.



LEARN MEAT CUTTING At Home—In Spare Time

Get into the vital meat industry. Concise, practical Home Training based on 25 years proven instruction methods used at National's famous resident school. Prepares you for bigger pay as Meat Cutter, supervisor, market manager or more money in your own store. Go as rapidly as your spare time permits. Diploma. Start **NOW** to turn your spare hours into money. Send for **FREE** bulletin today. No obligation.

National School of Meat Cutting, Inc., Dept. O-32, Toledo 4, O.

LAW STUDY AT HOME

With A Chartered Educational Institution Men with legal training win higher positions, larger earnings, and are bigger successes in business and public life. Opportunities **NOW** greater than ever before. Complete course includes 20 college grade textbooks. Send for Catalog. McKinley-Roosevelt Incorporated, 4610-LB, Sheridan Road, Chicago 40, Illinois.



A SIMPLIFIED ART ANATOMY OF THE HUMAN FIGURE

by Charles Carlson. The book they're talking about! One of the most informative books of its kind for both student and professional artists. Charts, notes, and over 350 drawings show detailed studies of every part of the body, posed and in action. **ONLY \$1 POSTPAID**

HOUSE OF LITTLE BOOKS, 156-P Fifth Ave., New York

JIU-JITSU HOW TO BECOME EXPERT, Keep Health, Have Fun. Teaching 35 years. Send 10c for sample lesson.

Modern School Jiu-Jitsu, Dpt. AA, 5 W. 52 St., N.Y. 19



HARD-TO-GET RADIO PARTS

Real bargains on hundreds of hard-to-get Radio and Electronic parts are listed in our latest **FREE** bulletin. Thousands of satisfied, steady customers on our lists. Send for your **FREE** money-saving bulletin today.

NATIONAL ELECTRONIC SUPPLY

622 W. Kinzie Dept. PS-7 Chicago 2, Ill.

PIN-UP GIRLS

The kind men like! (pocket size). 20 assorted **PIN-UPS** sent for \$1. Shipped prepaid in plain wrapper. No C. O. D.'s. Send cash or money order. No stamps.

NUDKI
Dept. PA-314
Box 126, G.O.T., N.Y.C. 1



Enjoy Yourself...

Here's Your HOBBY!

MAKE PROFESSIONAL-LOOKING
PROJECTS
Worth \$5.00 to \$50.00 Each

CHOICE
OF 6 NEW
HOBBIES!

**FUNDAMENTALS
of PLASTIC
FABRICATING**



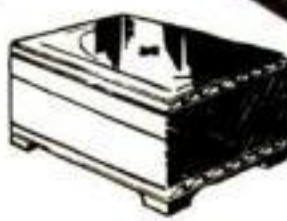
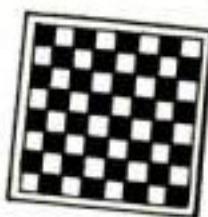
**The Technic of
PLASTIC CASTING**



**HOW TO
Pressure Mold
PLASTICS**



**Decorative
PLASTIC SPRAYING**



EVERYTHING YOU NEED

... Projects, Plans, Instructions
Materials and Equipment!

FOLLOW A
FASCINATING PASTIME
WITH A PROMISING
FUTURE. HAVE FUN ...
WHILE YOU LEARN
TO EARN!



● **WORTHWHILE HOBBIES** for pleasure and profit! Enjoy yourself while acquiring new skill and knowledge ... making distinctively designed lamps, clocks, jewel boxes and other beautiful objects. No, not ordinary "school" projects ... but smart, exclusive articles equal to those sold in Chicago and New York's high-priced stores. IT'S EASY AND SIMPLE NOW. No tiresome textbooks. You learn by doing, by having fun!

● **NEW METHODS and NEW MATERIALS**
Make Unbelievably Beautiful Articles

Out of this war are coming wonderful new materials ... Rainbow Plastics, Onyx-like Coatings, Plastic Extrusions, Overlays in colorful patterns of Rare Woods, Exotic Lizard-Skin finishes, etc. ... as well as remarkable applications in metals and woods. All these easy-to-use materials and more are yours to enjoy in a hobby plan that includes everything!

● **PROJECTS PLANNED BY**
Nationally-Known Designers

Every project — materials and easy, step-by-step instructions — created and planned by America's leading artisans. And yet, they are yours at amazing low cost. So have fun while you learn basic skills for a bright new future!

**FOR
FREE
DETAILS**

Check the Hobby
That Interests
You Most

for **MEN and WOMEN**
YOUNG AND OLD!

MAIL THIS COUPON TODAY!

HEMOCRAFTERS, Dept. C-1
360 N. Michigan Ave., Chicago 1

Please send Free Details covering plans, material and equipment for hobby checked below.

- | | |
|--|---|
| <input type="checkbox"/> Plastic Fabricating | <input type="checkbox"/> Plastic Spraying |
| <input type="checkbox"/> Plastic Casting | <input type="checkbox"/> Metal Crafting |
| <input type="checkbox"/> Plastic Molding | <input type="checkbox"/> Electroplating |

Name

Address

City Zone State

Readers Say:

Hot-Weather Problem Is How to Brake a Snow Sled

I HAVE built a power snow sled resembling the ones used by the Russians to transport supplies, only this one is built especially for speed and maneuverability to catch coyotes



and wolves with. It has a rear drive and uses an 80-hp. Franklin plane motor with a pusher prop. On good snow it will go about 95 m.p.h., which is fast enough to catch any animal, and then some. Now what I do not have on this outfit is a brake, which I need sometimes to make a quick stop in bad

places. I am wondering if any of your readers or inventors have ever built any of these sleds, and if so, what sort of brakes they put on, if any. There are several of these sleds in this neighborhood, but none has a satisfactory brake for use under all snow conditions.—P. H., Ennis, Mont.

Navy Man Makes Correction on Military Time

IN THE April issue of POPULAR SCIENCE MONTHLY, there was an article about military time in comparison with civilian time. I was glad to see it published, for it will help people understand what their loved ones are talking about when they receive letters in which military time is used. However, there was an error in your illustration, for you had the radio-silence periods marked in the wrong places. In Radioman School at Bainbridge, Md., we were taught that these periods are from 15 to 18 minutes after the hour, and from 45 to 48 minutes after the hour. I wish you would check on this.—R. L. T., S2/c, USNR, Bainbridge, Md.

R. L. T., is right. During these periods, two every hour, the operator must listen for distress signals on 500 kilocycles, which is the frequency universally used for such calls.—Ed.

A Drop of Ink Made This Man Think

ANSWERING A. B. N., of Syracuse, N. Y., indelible ink, from the GI standpoint, is any ink that a GI laundry cannot wash out. Writing inks, even of the "permanent" variety, can be removed from textiles and other materials. They are not waterproof. Indelible inks, under such names as India, laundry-marking, or drafting-room, are theoretically impervious to water.—M. B. O., S1/c (QM), Shoemaker, Calif.

There are various kinds of indelible inks, but one of the most resistant to change is a solution of a salt of silver. This is developed by light or heat, either of which reduces the salt to black silver.—Ed.

Here's an Open Mind on the Subject of Hypnotism

IN THE past year I have noticed that you have had nothing on hypnotism in the Readers Say section of POPULAR SCIENCE. I know there is nothing scientific about it, but is there such a thing as hypnotism, and how does it work?—B. M., Houston, Texas.

It Does Seem a Shame to Throw Them Out

COULD some kind reader tell me some uses for burned-out fluorescent lighting tubes, size 20, 40, and 100 watts?—B. R. L., Newmarket, N. H.

New Use for Silica Gel Suggested by Soldier

WHILE drying my toes at the showers the other day, I remembered an article I had read in P.S.M. called "Silica Gel, the Sand with a Thirst" or something like that. Anyway, since the essential function of foot powders is to dry the feet—especially between the toes in trying to relieve or prevent athlete's foot—wouldn't this super-thirsty silica gel make a good foot-powder base if ground very fine? Or, mixed with some other medicinal factor or factors, the silica gel could do the drying while the other constituents did the germ killing.—Pfc. A. V., New York City.





BEFORE DINNER

SHERRY—Serve delicious, amber ROMA California Sherry...tangy, nut-like, appetizing...with the sun-ripe grape flavor and goodness brought to you intact by the skill and care of ROMA's noted wineries located in the choicest vineyard districts of California.



AFTER DINNER

PORT—Open a bottle of glorious, deep-red ROMA California Port...full-bodied...richly fruity. Or serve it any time...any evening. Unvaryingly good...always delightful. And—like all ROMA Wines—this superb quality and flavor for Only Pennies a Glass! Roma Wine Co., Lodi, Healdsburg, Fresno, California.

ROMA ESTATE Wines

MORE AMERICANS ENJOY ROMA THAN ANY OTHER WINE!

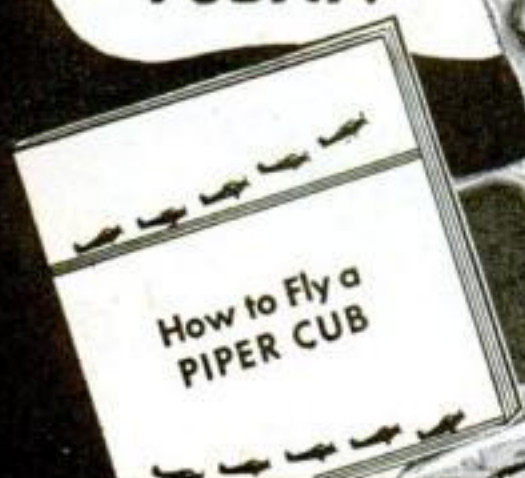
JULY, 1945

Buy War Savings Bonds and Stamps regularly.

29



**GET THIS
"HOW
TO FLY"
BOOKLET
TODAY!**

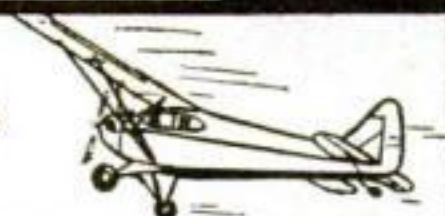


**SEE
HOW TO
TAKE OFF**



**SEE
HOW TO
CLIMB**

**SEE
HOW TO
TURN**



**SEE
HOW TO
GLIDE**

**SEE
HOW TO
LAND**



Also full-color photos of Piper models, color drawings of plane construction, controls and instruments. For booklet send 10c in stamps or coin for postage-handling. Piper Aircraft Corporation, Department PS75, Lock Haven, Penna.



PIPER CUB

POINTS THE WAY TO WINGS FOR ALL AMERICANS

Readers Say:

How Do You Make an Electric Chair for Flies?

I LIVE on a farm, so we are bothered quite a bit by flies. As I am very much interested in electricity, I wondered if one of your readers could tell me how to make an electric fly killer.—R. I., Loving, N. M.

There was an article in *P. S. M.*, September 1937, entitled "Electrocuting Insects," which answers R. I.'s question.—Ed.

Who Knows a Timesaver for Nailing Up Apples?

WE ARE farmers, and we want to know if any readers of your magazine know of a quick way to nail wooden pine cleats on apple-box ends. The cleats and ends are 7/16-in. thick. A regular nailing machine to do this work costs around \$1,500, and that's too much money for us. We nail around 2,000 boxes each year by hand. That means 4,000 ends, and it is slow work, especially with the labor shortage. Therefore we would appreciate any information that the readers of *POPULAR SCIENCE* can give us. The size of nails used is 1½-in. No. 3 wire.—E. M. B., Tilton, N. H.

Correspondent Has the Answer; Now See What You Can Do

UNTIL now I have not had the time, or maybe the ambition, to write to Readers Say, even though I have kept my copies of *P. S. M.* from way back in 1928. I enjoy every single article in your magazine, and like very much the way you can put over an article that, in the first place, doesn't appeal to me but in which I find myself later really interested. I like the brain busters in Readers Say, so now I have gotten around to enclosing a drawing of a metal casting. It shows what is both the top and the end view, since both are exactly the same size and shape. Now, what does the front view of the casting look like?—E. B., Vancouver, B. C., Canada.





Learn **PLASTICS**
FABRICATION

New - Profitable Industry!

START YOUR OWN BUSINESS

YOU'LL really enjoy learning plastics this new, interesting way! For you'll actually make beautiful, useful plastics articles during your home study training with Plastics Industries Technical Institute.

NOW'S YOUR OPPORTUNITY—Yes, the exciting age of plastics is here! Demands of war have caused phenomenal growth in the plastics industry—creating exceptional opportunities for those who know plastics. If you are a person with an eye to the future, you won't remain on the outside looking in—you'll want a choice position in the growing, expanding plastics field—or a plastics business of your own.

WE SUPPLY MATERIALS—For your interesting and practical work with plastics, we supply handsome, colorful, transparent rods, sheets and tubes of plastics from which you make useful, attractive creations. You saw, cement, machine, buff, form, dye, decorate, cast and laminate various types of plastics. You also design

your own plastics articles—develop your own ideas—express your originality. Earn money while learning.

A COMPLETE COURSE—This practical training in plastics fabrication is only *one* part of the Plastics Institute home study course. In addition, you learn about the many types of plastics, their manufacture, characteristics, properties and uses—intensive coverage of molding and mold design—testing and cost analysis—everything to prepare you for your place in plastics.

START YOUR FUTURE TODAY—Mail the coupon below now! We will send you an interesting, illustrated free booklet with valuable information about plastics. We'll tell you how, at small cost, you can prepare for a future in this important industry while carrying on your present work. Don't put it off. Clip the coupon and mail it today!

VETERANS: ASK ABOUT G.I. TRAINING

Dept. P55-7, 122 E. 42nd St., New York 17—Dept. P55-7, 221 N. La Salle, Chicago 1—Dept. P55-7, 1601 S. Western, Los Angeles 6

SPECIAL RATES FOR SERVICE MEN

Plastics

INDUSTRIES TECHNICAL INSTITUTE

Plastics Industries Technical Institute

221 N. La Salle St., Dept. P55-7, Chicago 1

Gentlemen: Please send me the booklet "World of Plastics" and information on your training program. I understand there is absolutely no obligation.

Name.....Occupation.....

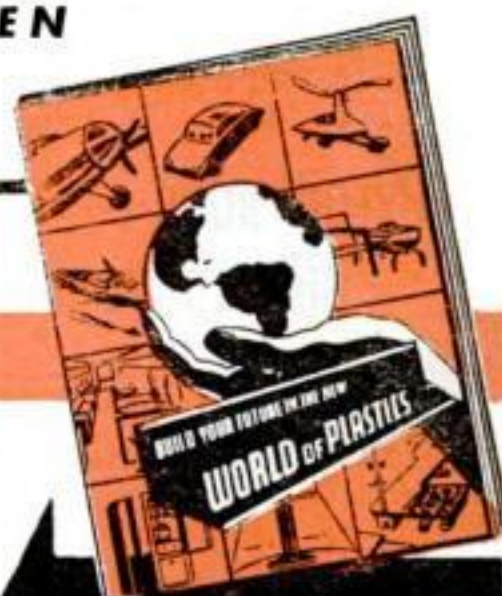
Street.....Age.....

City.....Zone.....State.....

☐ Veterans: Check here for special information.

☐ If under 18: Check here for special booklet.

Mail in Envelope or
paste on penny postcard



FREE BOOKLET
Send For It Today!

DON'T WAIT until it's too late...ADD PYROIL NOW!



Yes, there is such a thing as adding Pyroil too late. Pyroil cannot help recover the wear that has already taken place. It cannot restore life to your car that is already lost.

But it can very definitely add length of service to a car that still has service to give. It can reduce wear due to friction by preventing oil from draining off piston and cylinder walls. It can prevent corrosion. It can reduce carbon formation, free away sludges and gums. Pyroil *cleans* your motor. Pyroil *keeps your motor clean*. Pyroil *lubricates* your motor. Ask your gas station attendant to add Pyroil.

Manufactured and Guaranteed
by Pyroil Company
W. V. Kidder, Founder
970 Main Street
La Crosse, Wisconsin

**Pyroil adds
life to your car!**



PYROIL COMPANY

970 Main Street, La Crosse, Wisconsin

I want my car to last and run properly. Please tell me more about Pyroil and how it can accomplish this for me.

Name.....

Address.....

City or Town.....State.....

Readers Say:

Here's How Old Bicycle Tires Save Paint

So P. M. J., of Charlottesville, Va., would like a use for his old bicycle tires, eh? Well, how about this one? Nail them around the edges of small private wharves to prevent damage and loss of paint on the boats that bump and rub against them. I have tried this on our Mississippi River wharf, and I know it works. But of course they don't have the Mississippi in Virginia!—R. F. L., Davenport, Iowa.

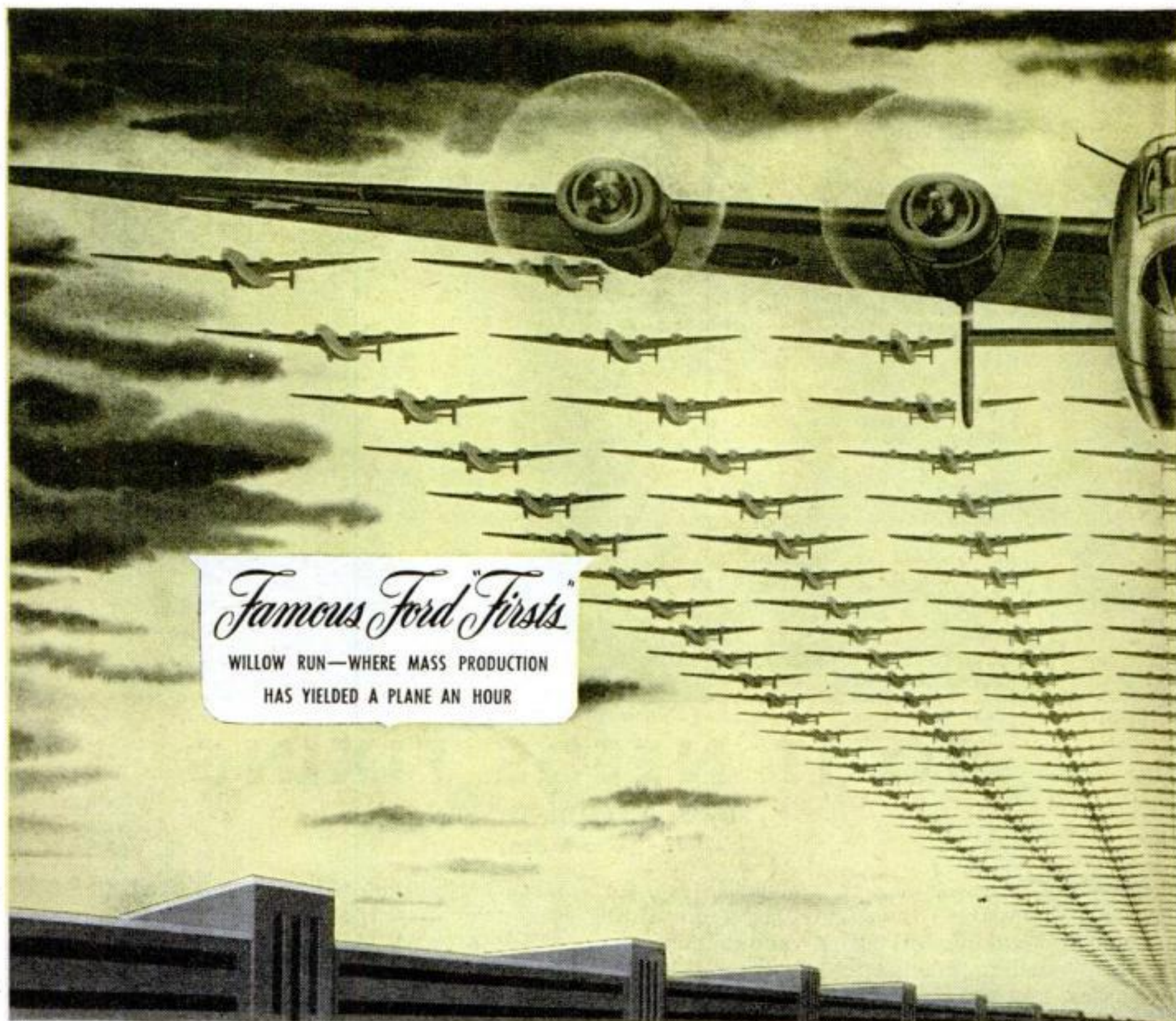


Leakless Sewer-Pipe Joints Are Possible Without Tinning

I WOULD like to add to Pfc. A. V.'s comments on connecting sewer pipes. He suggests the tinning of sewer-pipe joints as a possible aid to making them watertight. This would be both expensive and unnecessary because, for many years, plumbers have been using a special compound that comes in rope form to prevent leaks. This substance is about 1/2 inch thick, and has the packing quality of dentists' filling. No lead is needed, since the preparation contains a certain proportion of that metal. The pipes are joined, oakum is packed in, and then the compound is added and hammered into a solid mass with a calking tool. There is no heating, tinning, or fussing necessary with this method. You don't have to try a connection for leaks, either, because it just won't leak.—R. E., Jamaica, N. Y.

Reasonable Theory to Explain Spiders' Four Pairs of Eyes

BECAUSE I have had some experience with spiders, I was especially interested in the article on them in your January issue. I would like to offer a suggestion with regard to why some spiders have four pairs of eyes, each with a different-sized image and angle of vision. Does it not seem reasonable that, since they have a fixed focus in each pair of eyes, several pairs may be equivalent to a variable-focus lens such as human and animal eyes possess?—J. L. H., Seattle, Wash.



Famous Ford "Firsts"

WILLOW RUN—WHERE MASS PRODUCTION
HAS YIELDED A PLANE AN HOUR

1st

to build bombers by
automobile methods!



More than 8500 four-engine heavy planes have come off the assembly lines at Willow Run.

Behind this achievement, unequalled in aircraft history, is an amazing story. Ford Motor Company decided to apply to plane building the precision mass-production methods it pioneered in the automobile field.

This called for erection of the largest building of its kind. It meant designing thousands of new machines and fixtures—setting up 91 conveyor lines and 29 miles of craneways—training thousands of workers.

The plane, containing over a million parts, had to be broken down into production units which

could be integrated into the assembly system.

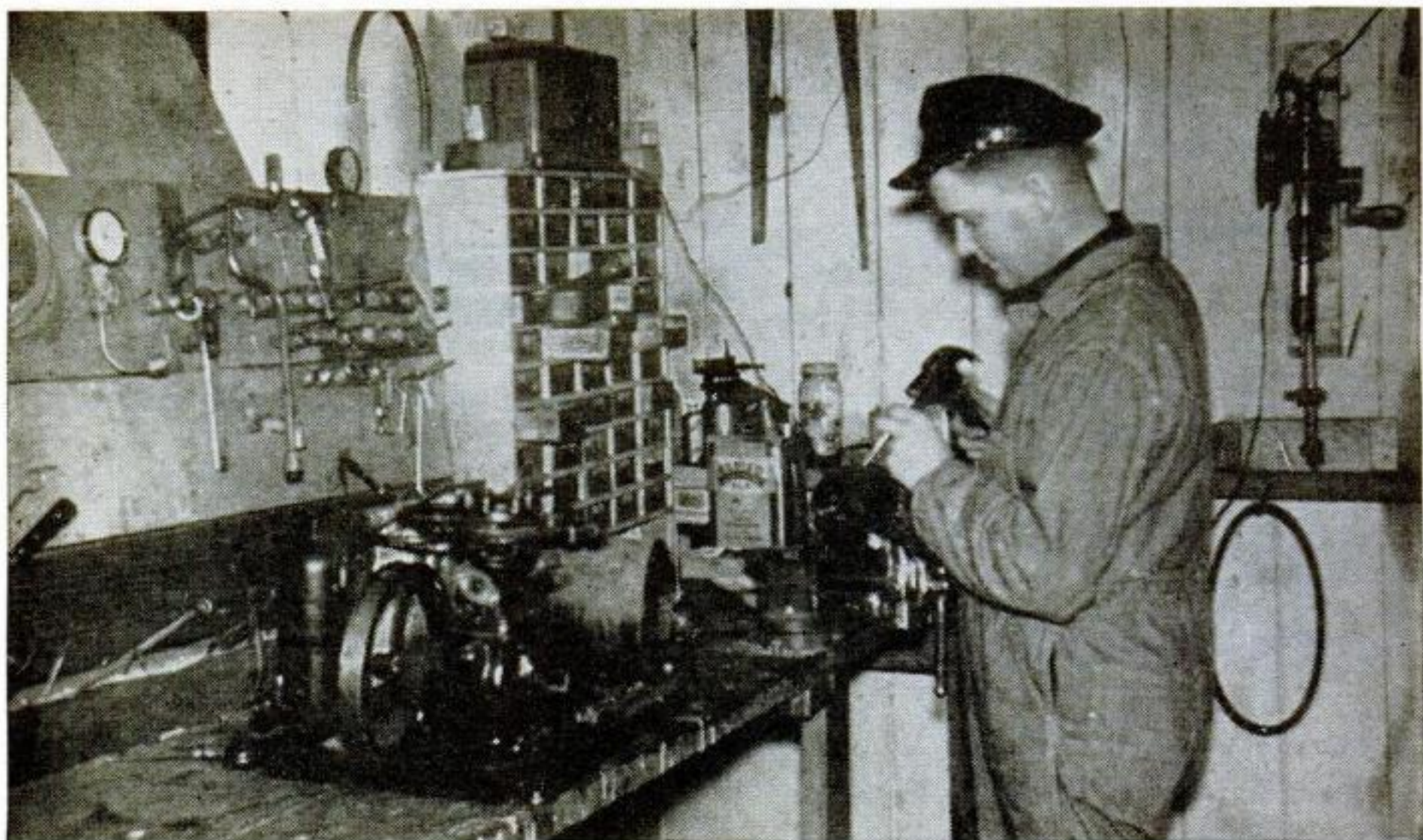
Important shortcuts were developed at every turn. In the case of the center wing section, for example, the construction time of standard aircraft methods was reduced 94%.

Raw material went in one end of the plant . . . planes came out the other, at a peak rate of one every hour, ready to fly away.

Here is another Ford "first." And in the days ahead, new Ford-built cars and trucks will benefit by this same skill and resourceful engineering.

"THE FORD SHOW" Brilliant singing stars, orchestra and chorus. Every Sunday, NBC. 2:00 P.M., E.W.T., 1:00 P.M., C.W.T., 12:00 M., M.W.T., 11:00 A.M., P.W.T.

EXPECT THE "FIRSTS" FROM FORD!



SO IT NEEDS FIXING

By S. T. CHRISTENSEN
the "Fix-it Man"

"**W**ELL, I guess I'm the fellow to see, for I've repaired thousands of refrigerators (home and commercial both), vacuum cleaners, radios, washing machines, irons, fans, lamps, mangles, motors, etc. In fact, many of my customers call me their "electrical appliance doctor." And, "doctoring," I might add has paid me a good substantial income for quite a few years. Funny, in a way, how I got started. Always liked to tinker and by experimenting around I found that most electrical appliances had many things in common. That, regardless of what the appliance was used for, or who the manufacturer was, the basic principles were much the same. From fixing my own appliances to fixing friends' and then for strangers at a fee, seems now to have been but a small step.

What to Charge?

At first, I let the owner decide the charge and, frankly, I was amazed at what I earned per hour. But then, when one figures what initial costs are involved in buying most electrical appliances, one can readily see that spending extra dollars for repairs is well worth while. Before long I was making more in my spare time repairing than from my regular job. The result . . . I went into business for myself. When war came, business boomed, for new appliances were not available.

For a while, repair parts (needed on some jobs) were a little difficult to get. But that

situation seems to have adjusted itself for many repair parts have today the high priority rating of AA2. After all, we must provide for the health and well-being of our civilian population.

The Future Offers

Friends ask me about my future. And, I think I've got a grand one. Age is no handicap in repairing. I have in my files enthusiastic letters from repairmen ranging in age from 18 to 79 years. After the war, we're bound to see hundreds of new products on the market . . . products that the average person never dreamt of. These new products and our old appliances are all going to need at some time or other "fixing." Well, I'll still be the fellow to do it. The field open for appliance repairmen is unlimited. I don't worry at all about too much competition.

If You Are Ambitious

To the contrary, I've prepared a complete course, chuck full of simple, easy to understand photos and drawings and written in the same non-technical language as this article. I know the course is good, because I have hundreds of men all over the country writing to me telling me how the course has helped swell their pockets with cash. If you too want to prepare now for your future, I suggest you read the next page and send me the handy coupon."

Adv.



**BIG MONEY
INDEPENDENCE**
*A PROFITABLE
LIFETIME
BUSINESS
OF
YOUR OWN!*

LEARN ELECTRICAL APPLIANCE REPAIRING

PREPARE NOW FOR THE FUTURE

If now in war work, start your home appliance repair business NOW in your spare time and be set with a business of your own when the war is over. You don't need elaborate fixtures or expensive equipment to be a successful repairman. Operate from your garage, basement, vacant store, etc. Work as many hours as you wish—the home appliance repairman is his own boss. It is a profitable occupation for on many types of repairs it is not unusual for a repairman to charge on the basis of \$5.00 to \$6.00 per hour. Don't gamble with your future—learn a trade that will always support you. Remember, as long as electrical appliances are used, there will be a need for electrical appliance repairmen.

If you are at all mechanically inclined—can hold and use tools—then you have all of the qualifications required for becoming a big money earning home appliance repairman. It does not matter if you have not had a great deal of schooling or had previous experience along these lines—**WE WILL TEACH YOU.** Age should be no barrier—nor should any minor physical handicap.

New Course Tells All

Profusely illustrated, our new course shows you in simple, easy to understand language and drawings how to make each repair on refrigerators, vacuum cleaners, washing machines, motors, etc. Explains and gives you a working knowledge of electricity, welding, nickel plating, etc. Shows you how to build the power tools you need and how to solicit and keep business coming to you. Not a theory course but an honest to goodness course written by and used by repairmen the country over. Price of course is so low that the savings on your own household appliance repairs will quickly pay for it. Act now! Mail the handy coupon below today.

-----Read What Our Students Say About Course-----

I really believe your course the best investment a mechanically minded man can make.—Claude E. Allen, Indianapolis, Ind.

I have received your Course in Appliance Repairing and I must say I am well pleased with same. I am only sorry I did not have said Course some years ago. I have learned so much more through this course I would not part with it.—Charles Schwarz, Hamilton, Ohio.

The Course in Appliance Servicing arrived a few days ago. Want to take out a few minutes of my valuable time to let you know that this is just what I have been looking for ever since I opened up my Fix-It shop. I must admit that you told the truth when you said that it contains quite a bit more information than I bargained for. — P. J. Bretl, Sebring, Ohio.

I am a mechanic for the Western Union Telegraph Co. Three days after receiving the lessons in refrigeration I earned the exact cost of the course.—Henry S. Lee, Washington, D. C.

I work day times at the shipyard and after 4:00 P.M. I operate from my cellar and garage. I average \$10.00 to \$15.00 clear every day.—Walter Hanhy, Brockton, Mass.

GET STARTED TODAY—MAIL THIS COUPON

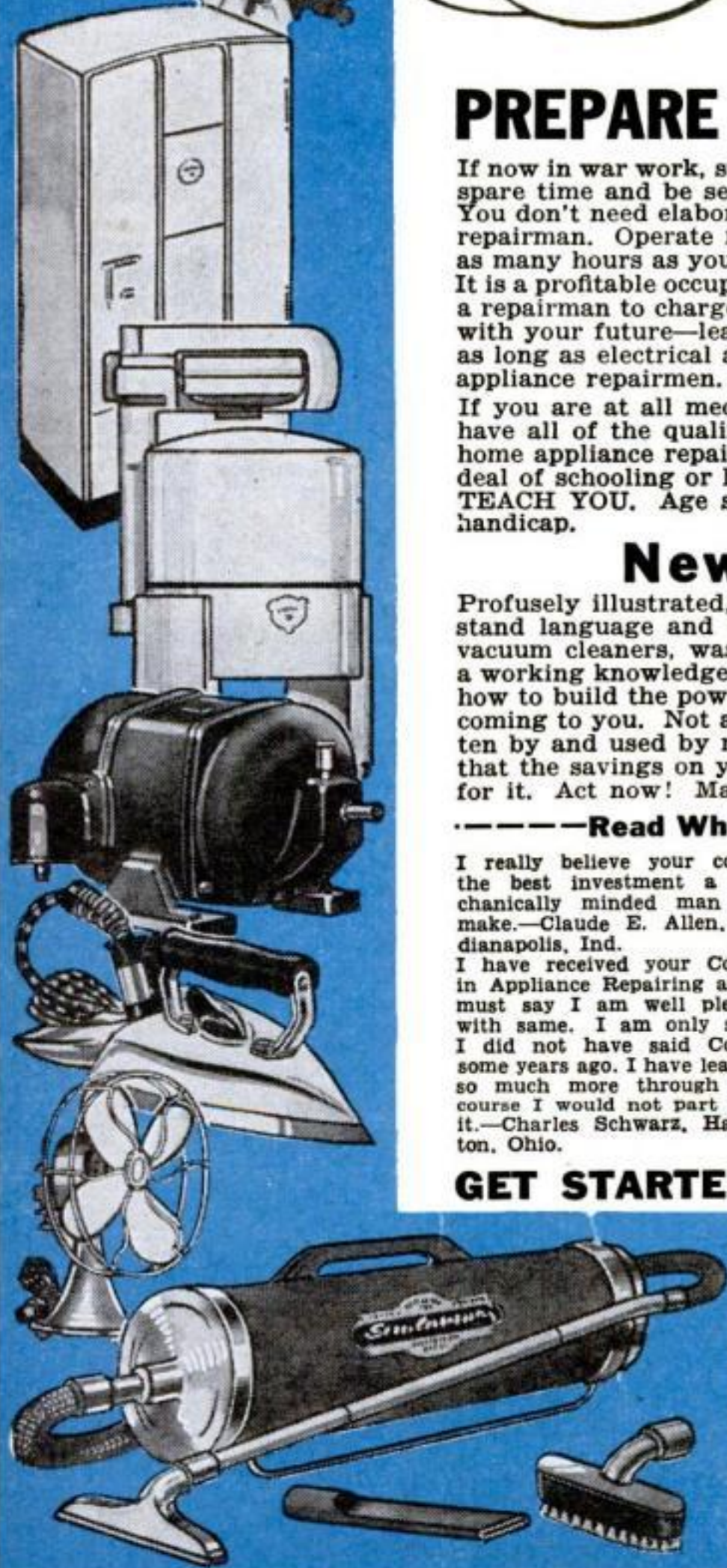
CHRISTY SUPPLY CO.
2835 N. Central Ave., Dept. D-3001
Chicago 34, Illinois

Please send me free illustrated literature about America's Fastest Growing Industry—**ELECTRICAL APPLIANCE REPAIRING.**

Name.....

Address.....

City.....State.....



JUST OUT! NEW FROM COVER TO COVER

AUDELS REFRIGERATION and AIR CONDITIONING GUIDE



4 Books in One! Covering:
 Basic principles, Servicing, Operation, Repair of
 1—Household Refrigeration
 2—Special Refrigeration Units
 3—Commercial & Industrial Refrigeration
 4—Air Conditioning Systems
 A gold mine of essential important facts for ENGINEERS, SERVICEMEN & USERS.
 A Good Book is a Good Friend! Here you have at your fingers' ends a Complete Library in ONE VOLUME, the necessary data you have been looking for on: MODERN UNITS, SYSTEMS & MACHINES, REFRIGERANTS, including Freon, Lockers, Water Coolers, Quick Freezing & Air Conditioning Systems.
 1280 Pages, 46 chapters all Fully Illustrated & Indexed for Ready Reference.

ANSWERS YOUR QUESTIONS
 Get This Information for Yourself. Mail Coupon Today. No Obligation Unless Satisfied. ASK TO SEE IT.

\$4 COMPLETE • PAY ONLY \$1. A MONTH

AUDELS, Publishers, 49 W. 23rd St., New York 10, N.Y.

MAIL AUDELS NEW REFRIGERATION GUIDE for free examination. If O. K. I will send you \$1 in 7 days; then remit \$1 monthly until price of \$4 is paid. Otherwise I will return it.

Name _____

Address _____

Occupation _____

Employed by _____ PSM

How to make a good living on a small farm

Want a small farm? Own one now? If you *do* want the enjoyment of security, a good living, pleasures of rural life, the freedom in being your own boss, **FIVE ACRES AND INDEPENDENCE**—the all-inclusive book by M. G. Kains, world's leading small farm expert—shows you how to select, how easily to run your farm successfully.

This book tells what kind of farm to rent or buy; how to choose it; finance it; what and how to plant; choice and care of livestock, poultry, bees, etc.; essentials of fruit and vegetable growing; fertilizers; irrigation; spraying; cultivation; harvesting; storage; sale of products and by-products. Every page packed with proved ways to make the small farm self-supporting—even profitable. Abundantly illustrated with workable plans and diagrams. Over 400 pages.

Plan now to get away from city worries, war shortages, high rents, inflation. Use this book as your guide. If not satisfied, return for full refund. **Send No Money Unless You Wish.** Pay postman \$2.50 plus 22c. COD and postage charges. If you send cash with order we pay all charges—you save 22 cents.



GREENBERG, PUBLISHER

404-N Madison Ave., New York 17

Send me **FIVE ACRES AND INDEPENDENCE** at \$2.50 postpaid. If not satisfied, I may return it within 7 days for full refund.

☐ Payment enclosed ☐ Send C. O. D.

NAME _____

ADDRESS _____

CITY & STATE _____

LEARN AT HOME TO MOUNT BIRDS



Animals, Heads, Fishes, Pets; to TAN. Be a Taxidermist. Profit and FUN.

Hunters, save your valuable **TROPHIES**. Mount ducks, squirrels, everything. Learn to TAN for leather and furs. Wonderful **HOBBY** Have a **HOME MUSEUM**.—**BIG PROFITS** mounting for others. **INVESTIGATE NOW.**

FREE BOOK With 100 fine game pictures. NOW absolutely **FREE**. Write **TODAY.**

Send Postal **TODAY** for **FREE BOOK**. State AGE. N.W. SCHOOL OF TAXIDERM, Dept. 339B, Omaha, Neb.



DRAFTING SPRINGBOARD TO SUCCESS!

Increased salary, larger responsibilities, a real career instead of just a job—these are to be had by the trained draftsman. I.C.S. makes the way to thorough, practical training open to you. Check up and you'll find that nearly every "big name" American in engineering and production acquired experience at the drafting board. Many of them started by writing for the I.C.S. free booklet. Send for it today! It can be the most important act of your life.

International Correspondence Schools, Box 7626-L, Scranton 9, Pa.



Complete Course Only \$15.00

DRAW CARTOONS BIG MONEY!

EASY... PLEASANT WORK!

Let CHAS. H. KUHN, with 25 years actual experience in drawing a daily newspaper cartoon, teach you how to create, draw and sell your work. 52 complete lessons—one sent each week. Professional criticism on every lesson. Write today.

KUHN SCHOOL OF CARTOONING
 420 MURPHY BUILDING Dept. S. INDIANAPOLIS 4, INDIANA

Inventions Wanted Patented or Unpatented

Inventions can now be safely sold without patenting expense. If you have a practical, useful idea for sale, either unpatented or patented, write today!

Institute of American Inventors

Dept. 3, 1926 Eye Street, Washington 6, D. C.

PATENTS

AND TRADE MARKS

C. A. SNOW & CO.

Registered Patent Attorneys Since 1875

Write for Free Book and "Certification of Invention" form

427 SNOW BUILDING, WASHINGTON 1, D. C.

PATENT YOUR IDEAS SEND FOR FREE BOOK

Written by Former Member Examining Corps (1922-24) U.S. Patent Office.

CARL MILLER, Registered Patent Attorney
 Former Member Examining Corps U. S. Patent Office
 Woolworth Bldg., Dept. 75-C, New York—Send Bldg., Dept. 75-C, Washington, D. C.



ART BOOK FOR STUDENTS

LEARN TO DRAW FROM THE NUDE!

This new ART book is illustrated with a series of photographs of ARTISTS MODELS IN FULL LIFE POSES. These models are posed in various action positions so that each part of the body is clearly revealed to make Life sketching simple for the student. Send \$1.00 (no C.O.D.)

FREE with each book we will send you our NUDE ANATOMY GUIDE.
MERIT BOOK CO., Dept. PS 3
 P. O. Box 163, Sta. A, Brooklyn, N. Y.

How to

GUARANTEE YOURSELF A GOOD LIVING....

THE only way you can GUARANTEE yourself a good living, come good times or bad, is to KNOW MORE than the average job-seeker about something important in the business world... something employers will pay you well for, or that you can use to set up a prosperous, independent Business of Your Own. ••• Here are listed just a few of the present and Post-War OPPORTUNITIES available to you. Here's your chance to choose the kind of occupation, trade or profession you'd like to master—here's that all-important practical information you require. ••• Just mail coupon for big FREE 100-page Success-Catalog showing thousands of ways to better your condition and IMPROVE and ENRICH YOUR LIFE.



Real Estate

SUCCESS... be a professional man

Practical training on how to run a profitable Real Estate Business of your own. Illustrated self-study lessons on farm and suburban properties, downtown operating. Gain a working knowledge of mortgages, listings, sales techniques, appraisals, property management, commercial leasing, contracts, etc. Real estate is the foundation of all wealth! **RUSH COUPON BELOW** for NEW facts you should know about your future in real estate. There's no obligation.

Practical REFRIGERATION



Brand New Streamlined Course for quick training. Authoritative step-by-step instruction on servicing household refrigerators... how to install, operate, repair. Easy-to-follow illustrated directions on troubleshooting, parts replacement, testing. Covers quick-freeze units, lockers, water coolers, freon, air-conditioning systems, etc. Amazing low price! Free details, see coupon.

Watch & Clock Repairing

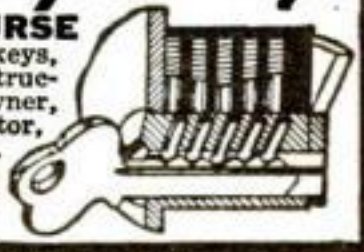


Learn at home in your spare time. Prepare for a Happy Future of prosperity, security, and get a big-pay job now. Fascinating! You can earn while you learn. Excellent field for part-time work at home. **Practical Course in HOROLOGY.** Thorough self-instruction training in American and Swiss watches and clocks. Special section on alarm clock repairs. Learn-by-doing instruction method. Interesting. Quick. Easy. No previous experience needed. Watchmaking is basic training for Aircraft Instrument Work and other scientific precision jobs. Fast-growing field... big opportunity. Mail coupon for **FREE** information TODAY.

Locksmithing & Key Making

PRACTICAL UP-TO-DATE COURSE

How to pick locks, de-code, make master-keys, repair, install service, etc. New, self-instruction lessons for every handy man, home-owner, carpenter, mechanic, service station operator, fix-it shop, hardware dealer, or gunsmith. **53 Easy Illustrated Lessons** **LOW PRICE!** Satisfaction guaranteed or money back. Write now—no obligation!



Practical RADIO Service

SELF-INSTRUCTION COURSE teaches you the practical side of radio... adjustment, operation, trouble-shooting. No previous knowledge necessary. Large, clear illustrations, diagrams, charts, etc. **Interesting Steady Work!** Set up a radio repair shop of your own—or prepare for booming industrial electronics. This useful, how-to-do-it course brings you all the fundamentals including mathematics, review questions, problems, answers. Strictly up-to-date. Coupon below will bring you full information you will want. Mail it in today. No obligation.



AUTO Mechanics



Let this **Practical, Low-Priced** course get you started in the auto repair trade. Good mechanics make big money NOW... and have a great future! Self-training lessons show you exactly what to do and how to do it. It teaches servicing on all makes of cars... adjustments, tune-ups, etc. Clearly written and illustrated by expert engineers. Satisfaction or a refund. Mail coupon now for **FREE** details.

Carpentry ~ Building ESTIMATING

There's a great future in the building trades for **trained** men. Up-to-date lessons how to plan, build, remodel houses, instructions: stair building, steel square, roofing, painting decorating, etc. Send for full information **FREE.** Use coupon.



MAIL ORDER BUSINESS YOUR BIG OPPORTUNITY!



34-lesson course on proved, tested, up-to-date, profitable methods. Amazing treasure-house of best mail order plans and practices. How to start your mail order business on a small one-man scale, how to keep it growing more and more profitable month after month. Money-making facts. **Free** sensational details. Mail Coupon!

What to INVENT how to INVENT

MECHANICAL DRAWING, DESIGNING, BLUE-PRINT READING—Practical course for the wide-awake practical men. IDEAS... how to get them, develop them, protect them and **promote** them! Expert information on how to turn your imagination into money. Plus illustrated self-study lessons on basic mechanical movements and devices. Mail coupon below for **FREE** details. No obligation.



INSURE YOUR FUTURE — Mail This Coupon Now! On this coupon check the subjects that interest you. Our world-famous copyrighted Success-Catalog will bring complete details, **FREE**... no cost, no obligation.

NELSON CO. 321 SOUTH WABASH AVENUE
Dept. 8G01, CHICAGO 4, ILL.

FREE! 100-page book... mail this now!

NELSON CO., DEPT. 8G01, 321 S. WABASH AVE., CHICAGO 4, ILL.
Please send me—**Free**, without obligation—illustrated Success-Catalog containing information about the subject (subjects) I've checked below. No salesman will call.

- | | | |
|---|--|--|
| <input type="checkbox"/> Watch and Clock Repairing. | <input type="checkbox"/> Locksmithing. | <input type="checkbox"/> Refrigeration. |
| <input type="checkbox"/> Practical Radio Servicing. | <input type="checkbox"/> Real Estate. | <input type="checkbox"/> Auto Mechanics. |
| <input type="checkbox"/> Mail Order Business. | <input type="checkbox"/> Carpentry. | <input type="checkbox"/> Inventions. |

NAME _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____



Be the "LIFE O'the PARTY"

Have fun. Be the center of attraction everywhere with this easy-to-play Song Flute. Sweet Flute-like tone. Play alone, or in group, with singers, guitar or other instruments. Anyone can quickly master it.

...EASY TO PLAY. Yes, almost as easy as whistling a tune. Just blow for tone, finger for notes, you can't miss. Eight tone holes give full chromatic scale. Low price. Carry in pocket or purse.

Get this FREE PLAYING GUIDE

Send coupon for interesting playing guide with complete playing instructions and music. See how easy it is. Amaze your friends. Ideal gift.

SEND NO MONEY

Mail coupon for Free Book and dealer's name today.

\$1

MAIL TODAY

CONTINENTAL MUSIC CO., INC. 630 So. Wabash Ave., Chicago 5, Ill.

Dept. 731

Please send free Song Flute playing guide and name of nearest dealer. No obligation.

Name _____

(Write address, town, state in margin)



MODEL RAILROADING

World's Most Fascinating Hobby for Men

We would like to send you a FREE 32-page booklet, "Your Model Railroad," which tells all about this absorbing hobby. Plan now for a postwar railroad of your own in attic, basement or spare room. Just send us a postal card asking for FREE booklet. SORRY. We can't urge you now to subscribe to the MODEL RAILROADER magazine because of paper restrictions but we would be glad to list you as an immediate postwar subscriber.

MODEL RAILROADER MAGAZINE
Dept. N, Milwaukee 3, Wisconsin



NEW CHEAP OIL BURNER

FOR COOKING & HEATING STOVES-FURNACES
HEAT YOUR HOME, COOK YOUR MEALS
WITH CHEAP FURNACE OIL



NO MORE SHOVELING COAL OR ASHES. New Fuelizer Starter Vaporizing System turns Cheap 130 Flash Furnace Oil into Oil Gas heat without clogging up. LIFE-TIME GUARANTEE against defects. \$1.00-BONUS OFFER FOR TESTING. We will let you try it in your own stove or furnace for one month. Get Yours for introducing. Big profits.



Be first. Send in your name today.
NORTHWEST MFG. CO., 537-J 5th Ave., Mitchell, So. Dak.

REFRIGERATION AND AIR CONDITIONING

SERVICE MECHANICS COURSE

Learn at home—how to start your own repair shop on little capital. No previous experience needed. Common school education sufficient. Splendid opportunity for older men. Prepare now for after the war. FREE illustrated booklet.

MECHANICS TRAINING SCHOOL

4701 W. Pico

Dept. S-7

Los Angeles 6, Calif.

LAW

STUDY AT HOME for PERSONAL SUCCESS and LARGER EARNINGS. 35 years expert instruction—over 108,000 students enrolled. LL.B. Degree awarded. All texts furnished. Easy payments. Send for FREE BOOK—"Law and Executive Guidance"

AMERICAN EXTENSION SCHOOL OF LAW
Dept. 55-S, 646 N. Michigan Ave., Chicago 11, Ill.



PULVEX FLEA POWDER

Kills fleas
100% SATISFACTION
...OR MONEY BACK

25¢
AND 50¢

INVENTORS

Do Not Delay!

Have you ever been startled by seeing a successful article on the market, and exclaimed—"Why, I invented THAT 5 years ago—I didn't think it was valuable enough to Patent!"

The Patent Laws were intended for the protection of the Inventor, and the Inventor who slumbers on his rights may wake up to find someone else reaping the reward that could have been his.

The Inventor with a valuable Invention should act NOW. Send this coupon TO-DAY—to RANDOLPH & BEAVERS, 340-D Columbian Bldg., Washington, D. C.

RANDOLPH & BEAVERS

PERSONALIZED SERVICE

Registered
Patent Attorneys
Washington, D. C.
340-D Columbian Bldg.

Please send me full particulars on Patents, fees, etc., and "RECORD of INVENTION form"—Free.

Name _____

Address _____

BENJAMIN H. C. PELLETS

AVAILABLE FROM FACTORY

and dealers:—Cal. .22 at \$2.00 M., Cal. .177 at \$1.80 M. Place your order now for a NEW Benjamin Air Rifle or Benjamin Air Pistol. Write today for illustrated folder of POSTWAR MODELS and POSTWAR PRIORITY PLAN. BENJAMIN AIR RIFLE CO., 811 MARION ST., ST. LOUIS 4, MO.



192 inches
VARNISHED

SPAGHETTI TUBING

Assorted colors and sizes! Will stand 5000 volts! Specially made for radio & television work. This Tubing insulates and protects bare wires, leads, resistors, etc. from other parts. Various colors provide easy tracing of circuits. Neater and quicker than tape for connecting, splicing, insulating. Olson's Spaghetti Tubing is very flexible and guaranteed not to crack even after aging. The biggest quarter's worth on the market. Act now! Clip this ad, write your name and address in margin. Mail with 25c to

Super Value!

25¢
POST PAID

OLSON RADIO WAREHOUSE, 73-K Mill St., Akron, Ohio



Send for Free
CATALOG

"The Book They're Talking About"

ART ANATOMY & FIGURE DRAWING

For the amateur and professional artist. Contains over 350 illustrations, charts and notes, giving detailed study of every part of the body. Viewed from different perspectives. Price Only \$1

MAJOR BOOK CO., DEPT. 41-F
72-04 Juno St., Forest Hills, New York

Get into Good Paying AUTO BODY and FENDER WORK



BIG DEMAND in Auto Body and Fender work. Start training now spare time at home for good pay work now and postwar. Practical shop experience included. U.E.I. Training covers metal work, welding, painting, etc. Placement service—or we will show you how to start own shop. Behind U.E.I. TRAINING is a large national organization founded 1927.

Write today for Free Facts—No obligation

ALTO-CRAFTS DIVISION • UTILITIES ENGINEERING INSTITUTE
1314 BELDEN AVENUE, DEPT. 375-X, CHICAGO 14, ILLINOIS

MASCOT SLIDE RULE

Fits the pocket. Quickly solves any problem in multiplication, division, proportion. Gives the square, the square root, logarithm and reciprocals of all numbers. Trig scales give sines and tangents of numbers. Fine black graduations on white celluloid. Complete with instructions. In fabricoid case \$1.00, in leather case \$1.25. Money back if not satisfied. Special offer to agents and dealers.



MONITOR SLIDE RULE 6" Dia.

[Made in white Vinylite. Same scales as Mascot Slide Rule. Complete with instructions. Without case, \$2.95. Leatherette case 75c additional.]

TAVELLA SALES CO., 21-G West Broadway, New York 7, N. Y.

Eight Basic Voice Lessons

\$1.00 Only . . . Train your voice at home. 8 basic lessons only \$1.00. Simple and easy; completely illustrated. \$1 refunded if not satisfactory.

VOICE STUDIO, Suite 910-A, Kimball Hall Bldg., Chicago 4, Ill.

HOW TO WRITE for PROFIT

Most famous authors come from ordinary walks of life. Many others could have succeeded had they used this proved, modern short-cut method of training endorsed by such famous writers as Gertrude Atherton, Rupert Hughes. Hundreds of successful graduates. You, too, may learn right in your own home to write fiction, newspaper features, magazine articles, radio scripts. **FREE** illustrated booklet explains how. Write today.

PALMER INSTITUTE OF AUTHORSHIP
6362 Hollywood Blvd., Hollywood 28, Cal., Dept. CM75

FREE
The Art of Writing
Salable Stories

ARTISTS MAKE MONEY

Find out your ability. Send name, age, occupation and address for Free Vocational Art Test.

ART INSTRUCTION, INC., 7145 Art Instruction Bldg., Minneapolis, Minn.
(Formerly Federal Schools, Inc.)

STAMMER?

This new 128-page book, "Stammering, Its Cause and Correction," describes the Bogue Unit Method for scientific correction of stammering and stuttering—successful for 44 years. Benj. N. Bogue, Dept. 1875, Circle Tower, Indianapolis 4, Ind.

**GET THIS
FREE
BOOK!**

CARTOONING

MAKE BIG MONEY
CASH IN on Big Cartoon Market. BECOME CARTOONISTS QUICKLY with our NEW, EASY METHOD. No experience necessary. Prepared by successful cartoonists. Only \$2.85 postpaid. **SATISFACTION GUARANTEED.** Sample LESSON PLATE and interesting literature **FREE.**
NATIONAL ARTISTS BUREAU
Dept. C-1, Box 4248 Dallas 8, Texas

Learn PHOTOGRAPHY at Home

Splendid opportunities. Prepare in spare time. Practical basic training. Long-established school. Send for free book, "Opportunities in Photography." No obligation.

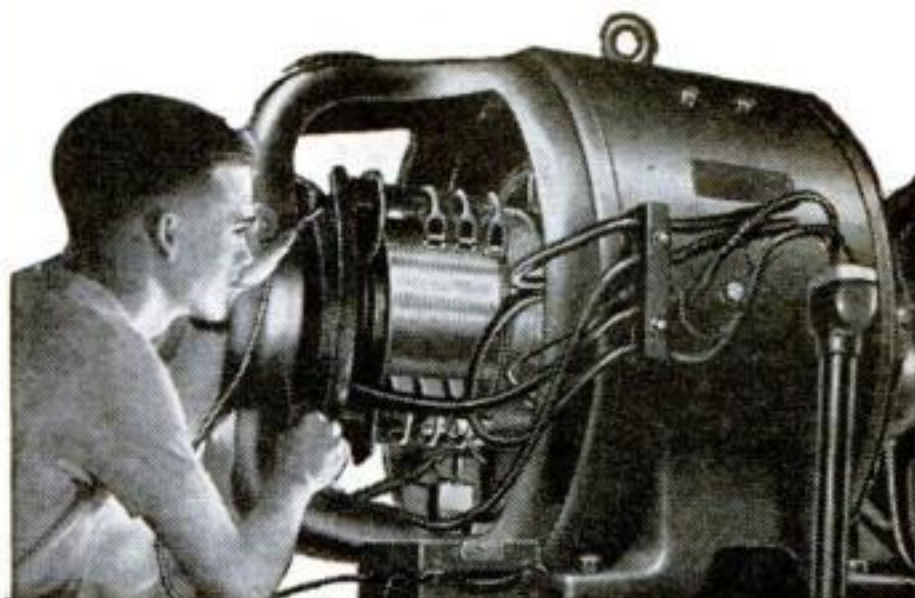
American School of Photography, 1315 S. Michigan Ave., Dept. 136B Chicago 5, Ill.



Wonderful, new device, guides your hand; corrects your writing in few days. Big improvement in three hours. No failures. Complete outline **FREE.** Write C. J. Ozment, 35-B St. Louis, Mo.

JULY, 1945

Buy War Savings Bonds and Stamps regularly.



Learn ELECTRICITY 12 WEEKS TRAINING ON REAL MOTORS, GENERATORS, ETC.

Trained Electrical men are needed now. It's not how young you are, or how old you are. The question is, have YOU the training to hold a good war-time job today—and a good job with a real future, after the war.

COYNE TRAINING is easy, practical. Located in Chicago, heart of vast war industries. Coyne has behind it 45 years of experience in training successful men. Mail coupon now!

"Learn-by-Doing" in the Great Coyne Shops

Get ready for a big future the quick Coyne Way—by actual work on full-size electrical equipment, not by correspondence. Learn house-wiring, motors, power plants, switchboards, auto electricity, etc. Be an "All-Round Electrical Man"—for big opportunities.

Train First—Pay Later

My "Pay-Tuition-After-Graduation" plan enables you to get training first, and pay for your tuition in easy payments after graduation. If you need part-time work to help defray expenses while here, I'll help you get it.

Lack of Experience No Bar!

Many of my students have never had Electrical experience. Others have had experience in one or two branches but realize they need all-around training for the better jobs. So whether or not you have had electrical experience you need Coyne training.

Get My Free Book!

Let me send you my big illustrated book showing how I help you get the training you need for a good Electrical job. It's **FREE**—no obligation—no salesman will call. Send the coupon today!

H. C. LEWIS, Pres.
COYNE ELECTRICAL SCHOOL
500 South Paulina Street,
Dept. B5-73, Chicago 12, Ill.

We have facilities for men with physical disabilities. If you have a physical disability of any kind check coupon below for details.

INDUSTRIAL ELECTRONICS Now Included!

No extra cost for valuable extra training in this big field of new opportunities!



H. C. LEWIS, President,
COYNE ELECTRICAL SCHOOL,
500 S. Paulina St., Dept. B5-73, Chicago 12, Ill.

Send me your Free Book. Tell me about your **SPECIAL INDUSTRIAL ELECTRONICS TRAINING** at no extra cost, and your "Pay-Tuition-after-Graduation" offer.

☐ Send Physical Disability details.

NAME.....

ADDRESS.....

CITY.....ZONE.....STATE.....

Now for EVERY WORK SHOP!

NEW Invention Electroplates by BRUSH



Easy to Plate CHROMIUM GOLD, SILVER, NICKEL, COPPER . . . For Pleasure and Profit!

If you have a workshop—at home or in business—you need this new Warner Electroplater. At the stroke of an electrified brush, you can electroplate models and projects—you can replate worn articles, faucets, tools, fixtures, silverware, etc. with a durable, sparkling coat of metal . . . Gold, Silver, Chromium, Nickel, Copper or Cadmium. Method is easy, simple, quick. Everything furnished—equipment complete, ready for use. By doing a bit of work for others, your machine can pay for itself within a week. So make your shop complete by getting a Warner Electroplater right away. Send today for FREE SAMPLE and illustrated literature. ACT AT ONCE! Mail Coupon.

WARNER ELECTRIC CO., DEPT. C-7
663 N. Wells St., Chicago 10, Illinois

FREE Details & Sample!

WARNER ELECTRIC CO., 663 N. Wells St., Chicago 10, Dept. C-7
Gentlemen: Send Free Sample and Details to:

Name _____
Address _____
City _____ State _____

Be Popular-Learn the Newest DANCES in 5 DAYS-or NO COST!

NEW REVISED EDITION of DANCING
Includes the Rhumba, Conga, Sambo, Jitterbug . . . Fox Trot, Waltz and Tap Dancing.

All the newest Swing steps—the Rhumba, Conga, Sambo, Jitterbug, as well as the Fox Trot, Waltz and basic tap steps—explained with simple, graphic diagrams.

GET MORE FUN OUT OF LIFE! Swing your way to popularity! Start now and fill your future with Romance! **MAKE THIS FREE TEST!** The new REVISED edition of Betty Lee's book, *Dancing*, helps you learn correctly and quickly. Be convinced—if not satisfied with results, you will get your money back! And remember, we include two other books—“Tip Top Tapping” and “Swing Steps”—FREE of extra charge.

SEND NO MONEY! Pay the postman \$1.98 plus a few cents postage. Follow instructions in ALL THREE BOOKS—practice simple dance steps each day and in 5 days if you haven't learned to dance, we will refund your money!



PIONEER PUBLICATIONS, INC.
1790 Broadway, Dept. 877H
New York 19, N. Y.

Send me “Dancing,” by Betty Lee, and include 2 free books.

☐ Ship C.O.D. I will pay on arrival, plus postage.

☐ I enclose \$1.98. Ship postage prepaid. If in 5 days I do not learn to dance, I may return book and you will refund purchase price.

Name _____

Address _____

City _____ State _____

PERSONAL STATIONERY!

Your Name & Address Elegantly Printed on 40 Sheets Whippet Bond & 20 Matching Envelopes . . . only . . .

We will elegantly print anyone's name and address, business or personal style, on 40 sheets of crisp, new Whippet Bond Stationery (made by Hammermill), and on 20 matching envelopes—all for only 25¢! Or, if you send \$1.00 for four sets we'll include one extra set FREE of any extra charge—or 5 sets in all postpaid! Same name, or as many as 5 different names on stationery. **Money-Back Guarantee.** Supply limited. Order Now! **WESTERN STATIONERY CO.**
Dept. 239-G Topeka, Kansas

25¢
POSTPAID

TECHNICAL DRAFTING and TOOL ENGINEERING

Technical Drawing, Production Illustration, Machine Sketching, Shop Mathematics, Machine Design, and Shop Practice . . . Tool Making and Design, Dies, Machine Shop, Lathes, Blue Prints, etc.
Special G.I. Counselor • Days, Evenings, and Part Time • Men and Women.

ALLIED SCHOOL OF MECHANICAL TRADES
1332 South Michigan Avenue • Chicago 5, Illinois
("Our Own Modern Seven Story Building")



MECHANICAL DENTISTRY AT HOME!

To make Crowns, Plates, Bridgework, etc., for Dentists. Easy practical way to learn mechanical dentistry at home in spare time. **FULL EQUIPMENT OF TOOLS AND MATERIALS INCLUDED WITH COURSE.** Low tuition. Easy terms. Write for **FREE BOOK** about this money making profession that is not affected by the machine age.

McCARRIE SCHOOL OF MECHANICAL DENTISTRY
207 N. Broad St. Dept. 840 Philadelphia, Pa.

DETECTIVES

TRAINING—SECRET INVESTIGATIONS—FINGERPRINTS
—Easy Method—Short Time, By Former Gov't Detective—Rewards, Home—Travel—Secret Code-Booklet **FREE—WRITE**
INTERNATIONAL DETECTIVE SYSTEM
1701-P Monroe St., N. E., Washington, D. C. 18

AMAZING MYSTERY BUTTON



Startles Everybody. With this *Electronic Button* you can make your own Telephone-Amplifier-Detectophone. Attach this button to piece of cardboard—transmit conversation to another room. Music also transmitted to distant places. Most interesting electrical apparatus ever discovered. Enables you to perform hundreds of experiments. So tiny it can be concealed in dozens of places. A Pre-War Product. *Electronic Button* including 5000 word instruction booklet with 50 illustrated experiments postpaid only \$1.00. **Electronic Products Company, Saint Charles, Ill.**

BACKACHE, LEG PAINS MAY BE DANGER SIGN Of Tired Kidneys

If backache and leg pains are making you miserable, don't just complain and do nothing about them. Nature may be warning you that your kidneys need attention. The kidneys are Nature's chief way of taking excess acids and poisonous waste out of the blood. They help most people pass about 3 pints a day.

If the 15 miles of kidney tubes and filters don't work well, poisonous waste matter stays in the blood. These poisons may start nagging backaches, rheumatic pains, leg pains, loss of pep and energy, getting up nights, swelling, puffiness under the eyes, headaches and dizziness.

Don't wait! Ask your druggist for Doan's Pills, used successfully by millions for over 40 years. They give happy relief and will help the 15 miles of kidney tubes flush out poisonous waste from the blood. Get Doan's Pills.

Big Demand for Wood! Prices Never as High! QUICK PROFITS with OTTAWA

THOUSANDS IN USE EVERYWHERE

OTTAWA 5 H-P LOG SAW

Speed Up Production!

Thousands Now making more money with an OTTAWA LOG SAW. You can beat the labor shortage with this dependable machine. Saws the human way, only many times faster. Easy to start in any kind of weather.

350 Strokes per Minute

Easy to wheel to your wood, start engine and saw. No shut-downs or strikes. Many exclusive OTTAWA features. Uncle Sam needs you to help relieve the nation-wide fuel shortage. No priority needed to buy an Ottawa. Plan to get yours now!

OTTAWA MANUFACTURING CO..



FELLS TREES —SAWS LOGS

Buzzes Up Poles and Limbs

Ottawa "5" cuts blocks or logs...limb saw and tree feller attachments can be added at any time. Does everything you need fast and easy.

USE ENGINE FOR BELT JOBS—
When not sawing wood, use engine to grind feed, pump water, etc. Pulley furnished!

FREE Big Catalog Write today for your FREE copy of the Ottawa Catalog.

1901 Wood Ave., Ottawa, Kansas

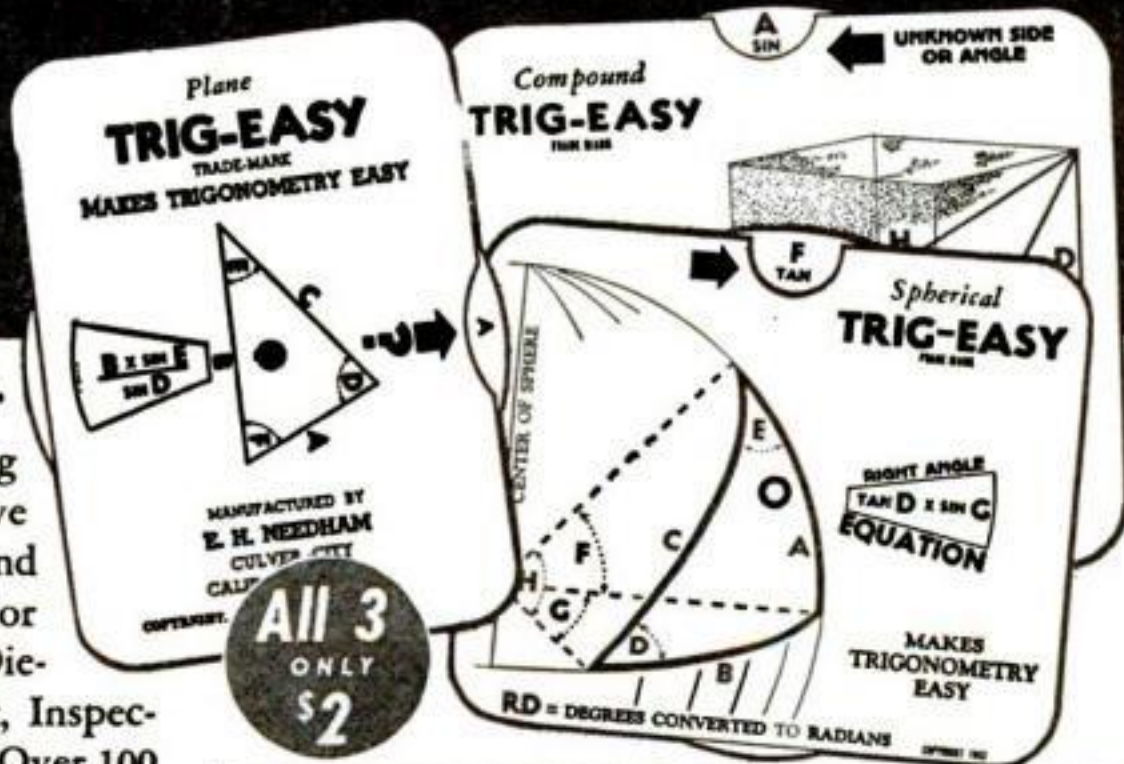
SPHERICAL, PLANE & COMPOUND TRIGONOMETRY

Made Easy WITH TRIG-EASY

Without Knowing Higher Math.

NOW...with these amazing TRIG-EASY Charts you quickly solve problems in plane, compound and spherical Trigonometry. Get in line for a big-paying job in Tool and Die-Machine Shop, Sheet Metal, Layout, Inspection, Pattern Making, Die Bore, etc. Over 100 Trig problems at your fingertips. Used successfully by thousands. Three charts...including instruction book...all yours for only \$2.00. (Bills, check or money order only.) Don't delay! Send now for this short-cut to big pay and promotion. Money-back guarantee.

TRIG-EASY E. H. NEEDHAM
CULVER CITY, CALIFORNIA
SOLD BY EUGENE DIETZGEN STORES IN U. S. A.



QUALIFY FOR BIG PAY!

E. H. NEEDHAM (Trig-Easy), Dept. 3L, Culver City, Calif

Dear Sir:

Enclosed find (\$) for TRIG-EASY sets or charts

as checked ☒

U. S. A. Negotiable Money Only.

NAME

ADDRESS

CITY

ZONE

STATE

PLANE

.50c each ☐

SPHER.

.50c each ☐

COMP.

\$1.00 each ☐

SETS

\$2.00 each ☐

Make Your Own Post War Plans NOW! Get Started QUICK in **DRAFTING**

I Will Train You Until You Get
a GOOD PAY JOB! — *Engineer Dobe*

Plan now for a better job and more pay as America Changes over to peace-time production. Drafting is the field—now bigger than ever before. And countless thousands of draftsmen and designers must come first—before new production can begin. Get into Drafting. Engineer Dobe will train you at home in your spare time. You'll get experience on actual work—the same kind of jobs you will do for the best paying firms. You will be trained until you are competent, experienced, and are actually holding a position that will bring advancement and pay raises as deserved. Write today for details.

WORKING TOOLS FURNISHED

Professional instruments, drawing table and other tools included and sent when you start.



PREVIOUS EXPERIENCE NOT NEEDED

I train you through practical jobs and give you experience as a reference to employers when you become competent. Lack of previous experience or higher education should not hold you back. Low cost—and monthly payments if desired. Write today for illustrated book and all details. No salesman will call. Give your age to get reply.

**MAIL
COUPON
FOR VITAL
FACTS**

Engineer Dobe, Div. 27, Libertyville, Ill.

Send me the Vital Facts on Drafting and Industrial Designing, your FREE BOOK and advertised list of positions for Draftsmen and Designers, wanted.

Name.....Age.....

Address.....

City.....State.....

Thompson BEATS the World on BOATS



**Better Built
Lower Prices**

Canoes \$83 and up

Rowboats \$60 and up

Outboards \$60 and up

Light Boat for Auto

Safe Boats With Full Length Spray Rails

Keep passengers perfectly dry—even at high speeds. Catalog also shows today's six most popular models of sailboats. Two big factories—save you freight.

CATALOG FREE
Write for your copy. State kind of boat in which you are interested.

THOMPSON BROS. BOAT MFG. CO. (188)
219 Ann St. PESHTIGO, WIS. (Write to either place) 119 Elm St. CORTLAND, N.Y.

BEST SHAVE EVER OR MONEY BACK!

Patented
SPEED-HONE

Keeps Blades
Keen

Shave with a grin—not a groan... For smoother shaves—use SPEED-HONE! SPEED-HONE puts "velvet-edge" on razor blades. MILLIONS IN USE. Dozens of shaves from every blade. Only 10c. If dealer can't supply, send dime for sample. CURTISS CANDY COMPANY DEPT. PS CHICAGO 13, ILL.

NOW Repair your own
ELECTRICAL APPLIANCES
with CHANITE Self-Welding ELECTRICAL HEATING ELEMENT flux. Generous amount, instructions enclosed. \$1.00 postpaid.
CHANITE SALES COMPANY, 914 South Main, Fort Worth 4, Texas

Electrical Training at Bliss

NOW OPEN TO VETERANS AND CIVILIANS AFTER 3 YEARS OF WAR TRAINING

BLISS

Intensive 8 months residence course in fundamentals of industrial electrical engineering, including radio and electronics. Extensive laboratory practice in electrical measurements; testing power equipment; circuit tracing; wiring techniques; radio and industrial electronics; use of machine tools; motor construction; drafting. Basic training meets industry's requirements for engineering aides, laboratory assistants; operating, production and maintenance technicians; customers' engineers; draftsmen.

Graduates hold responsible technical and executive positions in communications, power and manufacturing. Modern buildings, dormitories, dining hall, campus. Moderate cost. 53rd year begins July 9. Catalog.

107 Takoma Ave., Washington 12, D. C.

ELECTRICAL SCHOOL

A TECHNICAL INSTITUTE



Design for Arc Welding

Compiled by one of America's Foremost Authorities on Arc Welding. Every design from an actual product presented in flexible form for varying applications.

Hobart



This \$3.50 Investment may **SAVE**
you **HUNDREDS** of dollars.

100 pages
of designs
and redesigns
for arc
welding
on 5 days
approval.

It's the costs that have turned manufacturers to welded design. This book will prove to you in five days the value of "Simplified" arc welding over more costly methods. **DESIGNERS! ENGINEERS! PRODUCTION MANAGEMENT!** Order your copy today! Saves many times its cost. \$3.50 postpaid.
HOBBART BROS. CO., BOX P-751, TROY, OHIO

"One of the World's Largest Builders of Electric Arc Welders."



MAKE BIG MONEY with *Swedish Massage*

Men and Women, 18 to 50
Learn This Profession
in 90 days at Home

Earnings in the health-giving profession of Swedish Massage run as high as \$50 to \$75 per week or even higher. Large full time incomes from doctors, hospitals, sanatoriums and clubs, but many prefer to open private practice offices or make good money in spare time. You can qualify by training in your own home and win your Diploma. Anatomy charts and 32-page Illustrated Book FREE. Write today.

THE COLLEGE OF SWEDISH MASSAGE

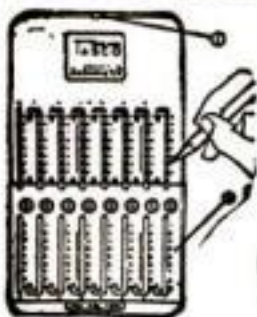
DEPT. 570H 100 E. OHIO ST. CHICAGO 11



Build with Cement Composition

Strongly reinforced with cheap wood. Modern stream-lined roof, walls and gutters. How to build a house 22x24, three rooms, as low as \$100 for materials; garage, \$20; 20x50 poultry house, \$50. Farm buildings for a few dollars. Homemade equipment to make wall-high building blocks with inside and outside finish; roof, wall and floor tile in color, and durable wallboard of sawdust for a few cents. Several formulas. Labor

saving, long lasting, no painting. Make doors and windows. Also sectional cabins, 100 money and labor saving building ideas. Mixer and saw easily made from old auto. 40 War-time Plans. Earn \$10 a day. Guaranteed. Illustrated instruction book, \$1.00. MAKE FURNITURE OF COMPOSITION. Cement, sawdust, paper, asbestos. Homemade cements. Some part scrap wood and metal. Make tables, cabinets, chests, racks, shelves, inclosed sinks, lawn novelties and toys. Over 500% profit. 50c. HOW TO MAKE ACCURATE WOODWORKING MACHINES, saws, drills, sanding wheels, tools, electric weed cutters and many other things from old auto parts and used motors. Illustrated. 50c. HOME MFG. ENTERPRISES. 50 selected home shop projects, 50c. Special: All of the booklets described above, \$2.00 postpaid. No C.O.D. HOME INDUSTRIES, 1318 So. 30th Ave., Dept. PS, Omaha 5, Nebr.



POCKET ADDING MACHINE

Sturdy steel construction for lifetime use. Adds, subtracts, aids multiplication. Capacity 999,999.99. A real machine—guaranteed 5 years. Thousands of satisfied users. Send name and address. We ship immediately. On delivery, pay postman \$2.50 (plus C.O.D. and postage charges). If you send \$2.50 with order, we pay postage. Leatherette case 25c additional. Your money back after 10 days' trial if not satisfied.

Free Trial \$2.50

TAVELLA SALES CO., 21-HA West Broadway, New York 7, N. Y.



COLLECT U. S. ARMY Shoulder Patches

Fascinating hobby. Patches 10c to 50c each. Complete set of 250 for \$50.00. Official patches available for every major Army and Air Corps unit. Send \$1 for sample assortment of patches and illustrated patch catalogue.

SPRINGER'S

270 San Francisco St., EL PASO, TEX.



Handbalancing Is FUN!

Enjoy the thrills of handbalancing. Walk on your hands. Learn this fascinating, muscle-building sport at home with my simple, inexpensive, Step-by-Step method. Mail penny card today for full information. POWER, 923 W. Vine, Kalamazoo 44, Michigan



ARMY & NAVY BARGAINS

GENUINE U. S. PUP TENTS (used) good cond., \$2.98
U. S. (NEW) ARMY PONCHOS (slightly imperfect) 4.95
NEW U. S. ARMY CANTEEN Collapsible cup,
All fitting into cover with Shoulder Strap..... 1.89
NEW NAVY TYPE CANVAS HAMMOCKS..... 3.39
NEW U. S. ARMY CANVAS LEGGINGS, pr..... 1.00
NEW U. S. ARMY PISTOL BELTS..... 1.49
Send Check or Money Order. Include 30c for postage.

THOUSANDS OF SATISFIED CUSTOMERS
WRITE FOR ILLUSTRATED FREE PRICE LIST

TRIANGLE

Dept. P, P. O. Box 156
TIMES PLAZA STATION, BROOKLYN 17, N. Y.

OUR
25th
YEAR

HEAR

with 1/2 the weight and bulk!

Beltone The Electronic Hearing Aid

THIS
ONE UNIT
IS ALL
YOU WEAR!



Black
or
Ivory

NO SEPARATE BATTERY PACK!
NO BATTERY WIRE!

23 years of electronic experience are behind Beltone, the *one* unit, precision-built, electronic hearing aid. This enabled Beltone to create a hearing aid *half* the usual weight and bulk for far greater wearing comfort — while providing *clearer, more natural hearing!* Fully guaranteed. Wherever you live, there's a Beltone dealer near you... a member of the nation-wide Beltone organization which specializes in giving expert help to the hard of hearing.

• A lifetime hearing aid. • Plug-in tubes, replaced as easily as a light bulb — Offered only by Beltone. • Inconspicuous, flesh-color earpiece and cord.

MAIL THIS COUPON TODAY!

BELTONE HEARING AID CO.

Dept. P7, 847 W. Jackson Blvd., Chicago 7, Ill.

Please send FREE booklet on BELTONE

NAME.....

ADDRESS.....

CITY, ZONE
AND STATE.....

LEO'S SPECIAL!
Immediate Delivery on this
Multitester
\$18.75
WRL 300 Less Leads



Handles AC and DC Voltmeter, DC Milliammeter, High and Low range Ohmmeter. Size 5 1/2 x 8 x 3 1/4. 3" meter with sturdy D'Aronsva movement. Write for priority information today.



PHONO AMPLIFIER KITS
Complete with tubes, all parts, chassis, diagram, etc. Priority AA-5 or higher. **\$9.50**
No. 1059.....

We Feature Hallicrafters

America's outstanding "radio man's radio." Available for immediate delivery on priority. Write for full details today!

These Items - Exclusive at Leo's
44 Page Radio Parts Flyer. FREE
Tube and Circuit Book.10c
Giant Radio Reference Map. 15c
Handy Tube-Base Calculator. 25c

Address Leo, Dept. PS-7
Council Bluffs, Iowa

Wholesale
RADIO LABORATORIES

A HOT COMBINATION!

POCKET-SIZE HOTPLATE WITH
"HEATAB" FIRE TABLETS



COMPACT
STOVE & HEATABS
\$1.00

There's nothing else like this sensational COOKIT—so compact you can carry both stove and miracle fuel in your pocket or glove compartment of your car! It's amazing how many ways people are using this famous COOKIT both indoors and out.

Hundreds of uses for mechanics, hobbyists, repairmen in factories, shops, homes, and home workshops. Great for camping, hunting, fishing. Heat all foods—fry or boil—start camp and picnic fires. Handiest portable heating method for homemakers, doctors, dentists, chemists and others. Used extensively by all branches of armed forces—a "swell" gift for friends and relatives in service—

Speaker COOKIT complete with hotplate and supply of HEATABS only \$1.00 at your dealer's; or order direct—\$1.00 postpaid. (In Canada \$1.55). No C.O.D.'s, please.

J. W. SPEAKER CORPORATION
3059 N. Well St., Milwaukee 12, Wisconsin
Canadian Speaker Corp., Ltd., Montreal



Speaker
HEATABS

FIRE
TABLETS

LIKE TO RELIEVE INCONVENIENCE AND PAIN?

ASTHMA RELIEF

A Modern Inhalant Method for
Relieving the Symptoms of Asthma
of Non-Cardiac Nature and Hay Fever

Money Back Guarantee

Send for Free Book, Dept. PS

BREATHEASY DISTRIBUTORS, INC.
OF DELAWARE

65 Cedar St., Seattle 1, Washington

Use This or Any Similar Product Only
As Directed by Accompanying Literature



Burpee's GIANT
PANSIES 35¢ pkt.
10¢

Plant Seeds this summer
for largest blooms early
next spring. All the richest
colors mixed, many gayly blotched.
To try, we will mail you a full-size
35¢-Packet, with growing directions,
for just 10¢. Send dime today!

W. ATLEE BURPEE CO.

278 Burpee Bldg. OR 278 Burpee Bldg.
Philadelphia 32, Pa. Clinton, Iowa

Correspondence Courses In **LOW AS**
RADIO and ELECTRICAL ENGINEERING \$25

ELECTRICAL ENGINEERING. Get good grasp of wide electrical field. Modern. Very understandable. Theory made easy.
RADIO ENGINEERING. Extra fine course in radio, public address, photo-electric work. Trains you to be super-service man, real vacuum tube technician. Tuition ONLY \$25, either course. Deferred payment plan. Servicemen needed badly.
FREE Write for free copies of school catalogs, student magazines, etc.
LINCOLN ENGINEERING SCHOOL, Box 931-S-79
LINCOLN, NEBR.

MEN! COMIC PRINTED POCKET FUN NOVELTIES



40 Comic Pocket Cards
12 Illustrated Booklets
6 Comic Love Letters
6 Laughable Diplomas
4 Printed Pocket Laughs
Everything \$1.00
Postpaid Sealed.

Fun Shop, R-2463 Kensington Ave., Phila. 25, Pa.



RHEUMATISM

ARTHRITIS - NEURITIS - SCIATICA
Why continue to suffer the agonizing pains of these diseases when the usual remedies have failed? Learn about a new trustworthy, modern,

non-surgical treatment method. This marvelous treatment is completely explained in the Ball Clinic's **FREE** Book. Write today. No obligation.

BALL CLINIC, Dept. 5100, Excelsior Springs, Mo.

ANALYZE HANDWRITING

Qualify for Certified Grapho-Analyst Degree. Earn up to \$100 weekly, up to \$1 hourly spare time, in new uncrowded profession... Graduates in employment and credit fields, police departments, courts, and in private practice as Personal Problem and Vocational Counselors. 3,000 word test lesson and illustrated **GRAPHO-ANALYST** Free



ADDRESS **A.I.G.A., INC., 126 JOPLIN, MO.**

WORLD'S LOWEST PRICED ADDING MACHINE

**VEST POCKET SIZE
IDEAL FOR BUSINESS OR PERSONAL USE**

**FREE TRIAL
ONLY \$2.50
TOTAL COST
SEND NO MONEY**

FREE!!
Each Baby Calculator in Beautiful, rich-looking Leatherette case—at no extra cost.



Fits vest pocket or purse. Guaranteed accurate. Operated as easily, and as reliable, as machines costing many times as much. Not a toy. Substantially made of 28-gauge steel—guaranteed for life against defects in construction. You positively can't buy a calculator of equal quality for as little money. **ACCEPTED AS THE FINEST LOW PRICED CALCULATOR FOR OVER 30 YEARS!** Operates with a flick of your finger. Adds, subtracts, multiplies, divides—counts up to ten million. Pays for itself over and over in mistakes avoided, and time saved. **MAKES IDEAL GIFT.**

Sold on a positive money back guarantee. Send only name and address, pay postman \$2.50 plus postage (send full cash if outside U.S.) Money back within 10 days if not delighted. **AGENTS WANTED!**

**CALCULATOR MACHINE CO., (Mfrs.)
DEPT. 456, P. O. BOX 1118, CHICAGO, ILLINOIS**

NEW WRITERS WANTED

New writers needed to re-write ideas in newspapers, magazines and books. Splendid opportunity to "break-into" fascinating writing field. May bring you up to \$5.00 per hour spare time. Experience unnecessary. Write today for **FREE** details. **NO OBLIGATION.** Postcard will do.

FREE

DETAILS

**COMFORT WRITER'S SERVICE
200-R1 South Seventh (2)**

St. Louis, Mo.

MEN POSTWAR OPPORTUNITY WANTED IN A NEW INDUSTRY NOW!

A limited number of men will be accepted for training in this new, fast growing multi-million dollar, nation wide industry. If you are mechanically inclined and want to protect your future with a big paying job, write us today. A postcard will do.

Write COMMERCIAL 209 W. JACKSON CHICAGO 6

Learn TOOL DESIGN

Qualify quickly as Machine or Tool Designer through spare-time home study. Many making \$100 to \$125 a week. Expanding industry calling for more machine and tool designers than available. Rush name and address today for facts on Machine or Tool Design. State age.

OHIO INSTITUTE OF TECHNOLOGY, Box 257, Greenville, Ohio

THERE'S MONEY IN CARTOONS!

RAYE BURNS will teach you **HOW to CREATE ORIGINAL CARTOONS** at home that you may **SELL!** Course contains 26 lessons and over 600 illustrations. All for **Only... \$2.85**

Send name and address for free details.

RAYE BURNS SCHOOL, Dept. 8, Box 3583, CLEVELAND, OHIO

MUSIC LESSONS

COMPLETE CONSERVATORY HOME STUDY COURSES
40 years of successful training in Piano, Violin, Cornet, Trumpet, Saxophone, Clarinet, Guitar, Mandolin—Voice, Ear Training and Sight Singing, Choral Conducting, Public School Music—History of Music, Harmony, Advanced Composition, Arranging. The only home study school teaching all courses leading to degree, Bachelor of Music.
UNIVERSITY EXTENSION CONSERVATORY Suite U-224, 785 Oakwood Blvd. Chicago 15, Illinois

Send catalogue and illustrated lesson for.....
Name.....
Street.....
City, State.....
Give experience.....Age.....

BIGGER PAY FOR THE MAN WHO KNOWS ELECTRICITY

EASY WAY TO MORE MONEY

Get the Knowledge that Means Security-Promotions

Here's a set of Electrical Books—just off the press—that are really **DIFFERENT**. This 7 volume set covers everything from house wiring to advanced work on D.C. and A.C. motors and equipment. Also includes Diesel Engines, Automotive Electricity, Refrigeration, Radio and Electronics. Over 3,000 subjects—10,000 facts clearly explained in easy to understand language. 45 years of training experience planned these books for the "beginner" or expert who wants to get ahead.

I'll Send the Complete Set for 7 Days' FREE EXAMINATION

I'll send you these helpful "show how" Illustrated Electrical Books **FREE** and postpaid for 7 full days' **FREE** Examination. Then you can see for yourself how they can help you get a bigger pay job now with promotions in the future. **SO HERE'S MY OFFER:**



H. C. Lewis

SEND NO MONEY

Send no money—just mail the coupon **NOW**. It costs you **ABSOLUTELY NOTHING TO SEE THESE BOOKS**, because I'll send you the complete set for 7 days' **FREE** examination. If not 100% satisfied return them and you owe nothing. If you keep them send either \$19.75 cash (you save \$1.25) or send \$3.00 after seven days and \$3.00 a month until \$21.00 is paid. If you act **NOW** I'll also include 1 year of consultation service and technical news bulletins at no extra cost to you.

Also See COUPON for Other COYNE Books! CHECK ALL OF THE BOOKS YOU WANT TO EXAMINE FREE.

H. C. LEWIS, President

**COYNE ELECTRICAL SCHOOL, Dept. B5-R8
500 S. PAULINA ST., CHICAGO 12, ILL.**

☐ Send me your 7 Volume Set **APPLIED PRACTICAL ELECTRICITY** for 7 days' **FREE** examination. I'll either return the set after 7 days and owe nothing or send you either \$19.75 cash or send \$3.00 after 7 days and \$3.00 a month until \$21 is paid. You also include at no extra cost 1 year consultation service and technical bulletins.

●● HERE ARE 3 OTHER NEW COYNE BOOKS. I'LL SEND YOU ANY OR ALL ON SAME 7 DAYS' FREE EXAMINATION



TROUBLE SHOOTING MANUAL
☐ Electrical, Radio, Refrigeration, etc. 612 pages—500 Wiring Diagrams. \$8.95—\$3 in 7 days & \$3 monthly or \$8 cash. 1 year Consultation Service and Tech. Bulletins included Free.



MANUAL OF ELECTRONICS
☐ Practical Electronics for Electricians, Radio Men, Service and Installation. \$4.95 after 7-Day **FREE** EXAMINATION. One year Tech. News Bulletins included at no extra cost.



ELECTRICIANS' HANDBOOK
☐ 400 pages of up-to-minute Electrical Formulas, Tables, Rules—Charts, Methods, etc. Price \$2.75 After 7-day Free Examination. 1 yr. Tech. News Bulletins included at no extra cost.

NAME.....Age.....

ADDRESS.....

CITY.....Zone.....STATE.....

☐ If you prefer to pay postman cash price shown: have on delivery, check here. Same **FREE** examination and money back guarantee of satisfaction.

Buy War Savings Bonds and Stamps regularly.

Be an EXPERT in **DIESEL** AUTOMOTIVES & MECHANICS

**GET THIS
FREE
LESSON
AND TRY IT.
OPPORTUNITY
BOOK TOO**

Better jobs—bigger pay are waiting for men who really know the new **MOTORS**—Carburetion, Ignition, Tune-up, Injection Systems. Here, at last, is the quick, easy, short cut to power and transportation skill. Send the coupon and learn all about

SHOP METHOD HOME TRAINING

If you are mechanically inclined, cash in on your natural ability. Get into this great established field now—a field with greater than ever opportunities—electric transmission, hi-octane fuels, jet propulsion, after the war. Thousands of good jobs in industry and with transportation companies everywhere. Start a lifetime, profitable business of your own. This practical speed-up training is up-to-the-minute—Internal Combustion Engines, Diesel, Butane—direct from the experimental, research and testing shops and laboratories of the great National Schools. Get the details. **FREE.**

MAIL OPPORTUNITY COUPON

Paste this on a post card or mail in envelope.

D NATIONAL SCHOOLS Dept. D-6
4000 S. Figueroa Street, Los Angeles 37, Calif.

Send me your **DIESEL AND MODERN MOTORS** book together with a sample lesson **FREE**. I understand I may keep and use this information without obligation.

Name.....Age.....

Address.....

City.....State.....

Include your zone number.

OTTAWA Post Hole Driller

A high speed, one-man driller equipped with fast new type auger. For any row crop tractor. Easy to operate from driver's seat. Make big money doing custom digging. Guaranteed. Write for details. **OTTAWA MFG. CO., 701 Elm St., Ottawa, Kans.**



**in every battle...
doing vital jobs...
unfailingly...**



that's
why
there
are just
a few
left for
essential
jobs at
home

BRIGHT STAR BATTERY CO., CLIFTON, NEW JERSEY

"JACKPOT"

Home Model COIN MACHINE

Get this new, colorful pay-out machine for your recreation room! Soon pays for itself! Three fruit reels. Costs player 5c per play. Pays off one quarter automatically on two cherries etc. (Retains 60% for house; 40% winnings for player). Also can be operated to pay off tokens, 25c size, bearing odds from 3 to 1 up to 100 to 1. Complete with 121 metal tokens. Size 10 x 10 x 10 in. Metal construction. Wt. 16 lbs. Send \$10.00 deposit, balance C.O.D., **\$49.50** F.O.B. Chicago. Immediate delivery... Each



Webb DISTRIBUTING CO.

612 NORTH MICHIGAN AVENUE • CHICAGO 11, ILLINOIS

Learn Radio Easier...Faster

"The Mystery of Radio"



WELL
ILLUSTRATED

simplifies training procedure, by outlining T-R-F & superheterodyne principles.

EXPLAINS the net work of circuits (One at a time) of an AC-DC five tube superheterodyne system.

ORDER this practical training aid without risk. If not fully satisfied, return within 3 days for refund. Only \$1. P. P. Send M. O., Bill or Check.

SCIENTIFIC RADIO SERVICE SYSTEM

SIOUX CITY, IOWA BOX 1285-S

Don't Miss
This NEW
BOOKLET

IT'S FREE!



**Woodworkers—Machinists
Artists—Painters—Hobbyists**

TIPS ON HOW TO GET AHEAD

Make your time worth real money. This **FREE** booklet lists today's best money making craft books. Thousands of ambitious men are earning big money because they took advantage of the tips offered in this **FREE** booklet. Send for your copy today.

THE GATEWAY BOOK CO., Dept. PS-7
32 N. State St. Chicago 2, Ill.

FOR COUGHS FROM COLDS,

cuts, aches, burns, sprains use **TAYLOR'S OIL** (Called Taylor's Oil of Life over 80 years). At your favorite store.

35c, 75c, \$1.50

G. C. Taylor Co., Inc., Fairport, N. Y.

JUST OUT-FASCINATING NEW

PIN-UP GIRLS

Real Photo Reproductions

Men, here's a set of "cuties" you'll be glad to own! Pocket photo size—10 different models—all are young, pretty, enticing.

Something Different!

Set of 10 Pin-Up Girls, only 50c postpaid. Two sets for \$1 postpaid. Send cash or money order. No stamps. Mailed in plain envelope.

MERWIN STUDIOS, Dept. 3-B,
30 East Adams St., Chicago 3, Ill.



**10
GORGEOUS ART
POSES 50c**
POST PAID

Buy War Savings Bonds and Stamps regularly.

LIQUID MARBLE

Make beautiful artificial Marble slabs. Pour from liquid state. Glazed or un-glazed. This Marble may be mottled, veined, multi-colored or left in its original snow-white state. The color is actually a part of the Marble, does not fade or wear away. Liquid Marble is unsurpassed on kitchen or bathroom walls. Easy to make and install. **PLASTIC FLOORING.** May be made in any color or combination of colors. Gives a lifetime of wear. Dustproof. Soundproof. Verminproof. Resilient to the tread. Lay out solid from wall to wall or in pattern design of various shaped blocks. **FLEXIBLE MOLDS** for plaster casting. Make your own molds for few cents each. \$1.00 in raw materials will make up to \$25.00 worth of finished goods. (Send no money.) We furnish names of buyers. Write now for free information, and get in on busy season just starting.

COMPO-TEX, Box 786-G, ST. LOUIS 1, MO.

CHEMISTRY IS OPPORTUNITY!

There's no limit to the chemist's chances for advancement... in salary... in importance. Experiments develop into giant new industries. Established industries rely on laboratories. I.C.S. training... practical... thorough... opens this great field to you. Instruction papers specially written by noted chemical engineers, consulting chemists, metallurgists. And these big experts are **EASY TO UNDERSTAND.** Our editors have explained all technical terms simply, clearly. Any person of ordinary intelligence can learn and make rapid progress. You have ambition. We have the training you need. Send now for free booklet!

International Correspondence Schools, Box 7626-L, Scranton 9, Pa.

"How to Make Money With Simple Cartoons"

A book everyone who likes to draw should have. It is free; no obligations. Simply address

CARTOONISTS' EXCHANGE

Dept. 1447

Pleasant Hill, Ohio

LAW

STUDY AT HOME for PERSONAL SUCCESS and LARGER EARNINGS. 35 years expert instruction—over 108,000 students enrolled. LL.B. Degree awarded. All texts furnished. Easy payments. Send for **FREE BOOK—"Law and Executive Guidance"**

AMERICAN EXTENSION SCHOOL OF LAW

Dept. 55-S, 646 N. Michigan Ave., Chicago 11, Ill.

WATCHES WANTED BROKEN OR USABLE

—all kinds, even Ingersolls. Highest prices paid for jewelry, rings, spectacles, alarm clocks, razors, cigarette lighters, gold teeth, etc. Cash mailed promptly.

Lowe's, Holland Bldg., Dept. PS, St. Louis 1, Mo.

SCRAP MERCURY WANTED

Ship us your supply of mercury (quicksilver) metal via Railway Express regardless of quantity or quality. Pack small quantities in thick-glass bottles with taped caps in good packing; larger quantities in metal pipes with metal caps. Scrap price paid promptly.

MERCURY TERMINAL

SANBORN BLOCK

NORWOOD, MASS.

DRAFTING

PREPARE NOW FOR A BETTER JOB

Begin now to turn spare time into money. Become a draftsman with opportunities for advancement. Be ready to qualify for a good paying job as industry turns to peacetime production.

If you are now doing routine drafting work, prepare now for promotion to a better job in your field. Send name and address today for **FREE** information.

American School, Dept. DDB46, Drexel Ave. at 58th St., Chicago 37

Name.....

Street.....

City, State.....

LOOK at this one-time weakling who became a man of MIGHT and MUSCLE in a matter of weeks!



"Starting with your Progressive Power Method as a 110 lb. skinny youngster, I have developed into what you see in the enclosed photo. I owe it all to Jowett. You are doing wonders." Bud Wolfe.

"Here's PICTURE PROOF

that Progressive Power can make YOU, too,

Tough as a Marine

in 10 minutes a day in your own home says George F. Jowett, worlds record holder for strength and greatest molder of men!

Let me power pack your body as I have for Bud Wolfe shown above and for thousands of other men and boys. Many of them came to me ashamed of their puny, skinny, scrawny bodies, but finished with me glorying in their new found might, power and muscle, proud of their bodies; bigger, huskier, vital, new men! I want to give you great whip cords of muscle! I want to put steel in your spine; armor plate your midriff, make a barrel of your chest and mold your legs of solid concrete. Just give me a chance at that body of yours—it's your most prized possession. Learn how a handsome, big body packed with power, strength and vitality will bring you what you want—success, friends, the admiration of men and women. Be proud of a big, husky body at the beach, in the gym or even in your street clothes.

MUSCULAR MAGIC for Your Arms, Chest, Back, Legs & Grip

In a few minutes a day, in a short time, I'll muscle-mold your whole body, adding inches and pounds of meat and might. I'll give you pulsing power, stamina and strength, vitality, energy and endurance. If I can't do for you what I've done for thousands, I don't want a cent of your money.

Rush Coupon for these Amazing, Quick Action Proven Strength Courses (in Book form)

NOW ONLY 25¢ EACH

Formerly \$5.00

ALL 5 for One Dollar!

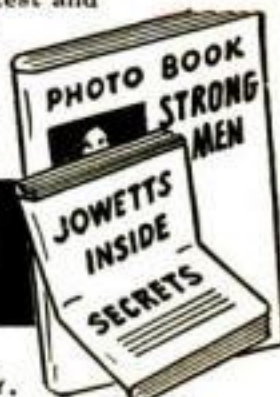


Put any one of them or all of them to any test and if you're not satisfied, let me know and I'll return your money. But act at once. I can't guarantee to keep this offer open. Mail coupon now! Today!

Jowett Institute of Physical Culture
230 Fifth Ave., Dept. 865-A, New York 1, N. Y.

JOWETT'S PHOTO BOOK OF FAMOUS STRONG MEN AND FOLIO OF INSIDE SECRETS

BOTH FREE!



Jowett Institute of Physical Culture

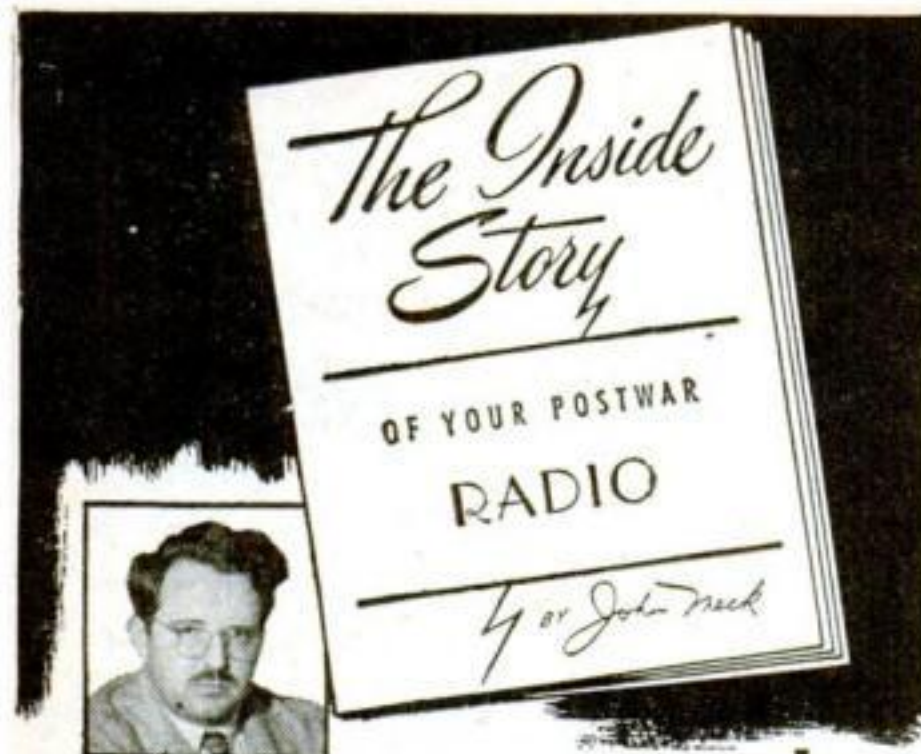
230 Fifth Avenue, Dept. 865A, New York 1, N. Y.

George F. Jowett: Your proposition looks good to me. Send by return mail, prepaid, the courses checked below, for which I enclose

() Include **FREE** book of PHOTOS and folio () All 5 courses for.....\$1 () Molding a Mighty Arm.....25c () Molding a Mighty Back.....25c () Molding a Mighty Grip.....25c () Molding a Mighty Chest.....25c () Send all 5 C.O.D. (\$1 plus postage.) No orders less than \$1 sent C.O.D.

NAME.....Age.....
(Please print plainly. Include Zone No.)

ADDRESS.....



REVEALED AT LAST!

THE INSIDE STORY of Late Technological Electronic Developments—as they affect your Postwar Radio

Read this informative story before you buy your new postwar radio receiver. Know what new developments have been achieved through extensive research in furthering the war effort.

Written by John Meck, leading electronic engineer, and, for the duration, producer of special devices required in communications services. INCLUDED—advance information on postwar MECK RADIOS. FREE—WRITE TODAY.

John Meck Industries, Inc.
Plymouth, Indiana

MECK RADIOS

SOLD BY INDEPENDENT DEALERS

110-VOLTS AC from DIRECT CURRENT

with KATO KONVERTERS. Furnish standard 110-v. AC from 32, 110, or 220-v. DC. Good deliveries on sizes 350 through 2500 watts on priority orders. Good deliveries on 5, 7½, 15 & 25 KW AC generators. Mfr's of motor generators, frequency changers and high frequency generators.

KATO ENGINEERING CO.,
125 Elm St., MANKATO, Minn., USA



Test-O-Lite the MODERN TROUBLE SHOOTER



THE NEON GLOW

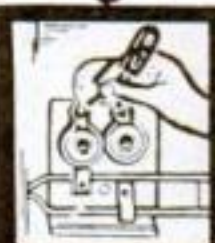
... LOCATES TROUBLE INSTANTLY in electric circuits, fuses, cut-outs, motors, radios, appliances. Tests everything electrical from 100 to 550 volts. Indicates hot or grounded wires. Tells AC from DC. Far superior to ordinary clumsy test bulb.

PUTS "FINGER" ON THE TROUBLE SPOT - QUICKLY

Saves precious time. Indispensable in shop or home. Has patented safety features. Vest pocket size with clip. Lifetime guarantee. List \$1.50 (Priority A7 required) Purchase through regular electrical dealers.

L.S. BRACH MFG. CORP.

55 Dickerson St. Newark, N. J.



FUSES



MOTORS



OUTLETS

ARMY GOODS (Used)

Hats and caps 10c, overseas caps 10c, Dungarees 95c, Tool boxes \$1, Gas mask Bags 50c, Raincoats \$1, Gun slings 75c, Holsters 75c, Canteens 50c, cups 15c, Mess Kits 35c, Leggings 25c, Cartridge Belts 50c, Minimum Shipment \$1. No C.O.D.
N.Y. SALVAGE, 144 CHAMBERS ST., NYC.



BURNED OUT or BROKEN ELECTRIC HEATING ELEMENTS REPAIRED WITH NEW AMAZING NICHROCITE

Simply overlap ends, apply Nichrocite Paste and turn on current. Used by large utility companies. Trial order, \$1.00; 4 oz., \$2.50; 1 pound, \$8.00. Armstrong Mfg. Co., Bx. 861-B, Minneapolis, Minn.



Yes, You can get a genuine "Simplified" ARC WELDER

Send for complete delivery information. State Your Priority No. and Type of Welding you do.



Quicker and Stronger Welds

are possible with only the latest developed welding equipment. And the latest developed is the Hobart "Simplified" Arc Welder... the same arc welder that has played such an important part in the all out production for "VICTORY." Hobart equipment is available to you now, and we'll be glad to send you complete information on request. Write us today!

HOBART BROS. CO., BOX P-75, TROY, O.

HOBART "Simplified" ARC WELDERS
with the Original and Exclusive Remote Control



HOBART "One of the World's Largest Builders of Electric Arc Welders."

31 Lesson Art Course CARTOONS & DRAWING

complete
only
50c



A practical Manual of Drawing which takes you through the various steps from simple lines to the advanced stages of complete drawings in pen and ink: Includes Portraits—Figures—Lettering—Posters—Commercial Art—Cartoons—Caricatures—Animals and even complete Comic Strips. You are shown how simple lines and outlines evolve into finished drawings of Heads, Eyes, Ears, Mouth, Expression, Hands, Feet, Bodies. How to draw Pretty Girls, Comic Women and Men, Kids, Horses, Cats, Dogs, Farm Animals, Caricature Animals, Symbolic Figures, Gag Cartoons, Sports Pictures, etc. How to put in Action, Shading, Wrinkles, Ben Day effects, and various details. Gives instruction in Anatomy—explains the fundamentals of Composition, Balance, Perspective, etc. Complete with over 600 ILLUSTRATIONS! . . . Whether as a hobby, to sit down at a party and draw your friends—or as a profession, for those desiring to master art and make a living from it—you can learn much from his MANUAL OF DRAWING by J. A. Patterson. Amazing bargain—no folderol or fancy dressing, all practical, sound information. That is why the price is only 50c. No C.O.D.'s at this special price, but double your money back if not delighted! Mail name and address with 50c money order, stamps or coin NOW.

KNICKERBOCKER PUBLISHING CO., Dept. 12
120 Greenwich St., New York 6, N. Y.

Complete \$20

ENGINES IN STOCK



The G. H. Q. miniature gasoline engine that really operates is still available. Over 100,000 sold to date. 1/5 H. P. Complete with fly-wheel and propeller, fuel, 15 accessories and full instructions. Fully bench tested and ready to run. Power for all models. \$20 complete. Send only \$1.00—Shipped Collect C.O.D. same day. Send for free illustrated Catalog of hundreds of hobby items.

GHQ MOTORS, Dept. SV75, 40 East 21 St., New York 10, N.Y.

STOPS HOME CANNING LOSSES



Levels all screw-top std. size jars, removes nicks, stops mold, milky peas, darkening of pears, etc., and loss of juice. New jars and old must be ground for perfect results. The solution to home canning. This is it. Order Today. \$3.95 prepaid in U. S. Free circular.

MIKALSON MFG. CO. Dept. S. Box 701.
EVERETT, WASH.



Titan Slide Rule

6" diameter. Easily read, clearly marked single index scales. Gives logarithms, reciprocals, squares, square roots, sines, and tangents. Continuous circular calibrations cannot go "off-scale." Invaluable in multiplication, division, proportion, conversion, all mathematical problems. Made of durable heavy pure white Vinylite. Complete with instructions. \$2.95. Leatherette case 75c additional. Money back guarantee.

PRECISION INSTRUMENT CO.
Box 654, Dept. AM Church St. Annex New York 7, N. Y.

TAPE WORMS
ROUND WORMS
(Ascarids)
HOOK WORMS
WHIP WORMS



...you can free your dog of all these worms

with

PULVEX
WORM CAPSULES

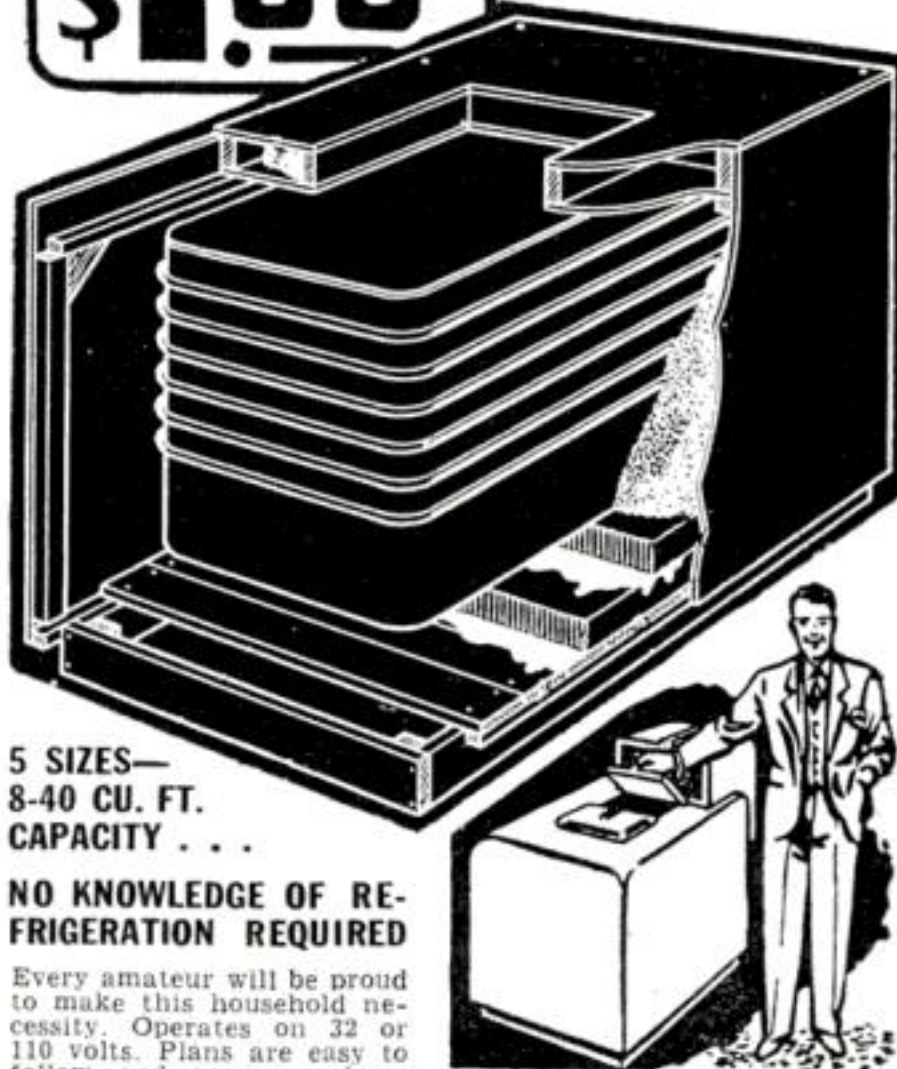
COMBINATION
TREATMENT

Used by leading breeders. At leading pet, drug, department stores, 50c a package (double size, 75c). Packed two ways: for puppies, for dogs.

PLANS ARE SIMPLE! THE NEW LEJAY FAST FREEZER

PLANS only
\$1.00

FROZEN STORAGE
from 5° above to 10°
below zero—FOR ALL
PERISHABLE FOODS



5 SIZES—
8-40 CU. FT.
CAPACITY . . .

NO KNOWLEDGE OF RE-
FRIGERATION REQUIRED

Every amateur will be proud to make this household necessity. Operates on 32 or 110 volts. Plans are easy to follow and you may have much of the material at hand. No special tools required.

MILK COOLER PLANS, Too,
are included with the FAST
FREEZER plans at no extra
cost

MAIL COUPON TODAY

Send \$1.00 bill, check or money order for complete plans and catalog. Canada \$1.10. Satisfaction guaranteed.

LeJay Manufacturing Co.
423 LeJay Building, Minneapolis 8, Minn.

Gentlemen: Please send me complete plans of your Fast Freezer and Milk Cooler, I attach \$1 bill () check (plus 5c exchange) () money order (). Canada, \$1.10.

NAME

ADDRESS

CITY STATE

LEJAY MFG.CO.
423 LEJAY BUILDING,
MINNEAPOLIS 8, MINNESOTA.

it's fun! to make "GOOD PICTURES"

WRITE TODAY FOR THIS 56 PAGE BOOK

IT WILL HELP YOU
SOLVE MANY PROBLEMS

- SELECTION OF FILM
- EXPOSURE
- DEVELOPING
- ENLARGING
- FLASH PICTURES
- FILTERS & COLOR

Send 25c to
ARGUS, INC.
Ann Arbor, Mich.
DEPT. H

argus

Cameras and Optical Instruments



NEW IDEA FOR TOUCHING UP AND REFINISHING FURNITURE!



• Surface stains or small nicks and scratches on furniture aren't quite so serious as they may appear to be. **Shinola Waxes** do a swell cover up job. Whether the piece of furniture is old or new—cherry, maple, or pine—there's a **Shinola Wax** to match wood of any age or color. These colored waxes are particularly helpful in restoring a rich, mellow finish to older pieces.

These same **Shinola shoe-polishing waxes** are swell for preserving linoleum . . . for finishing airplane and ship models, too. Ask for them by name . . . **SHINOLA**.

SHINOLA—10¢

IN ALL COLORS

TAN (RUSSET) • BROWN
OX-BLOOD • BLACK



(In Canada it's 2 in 1)

Buy War Savings Bonds and Stamps regularly.

INTRODUCING-New Victory Model HANDIWELD ELECTRIC

ARC WELDER

RETAILS
ONLY
\$1.95

FULLY
GUARANTEED



PLUGS INTO LIGHT SOCKET

Victory Model Handiweld Arc Welder operates from 110 volts, A.C. or D.C. current same as other arc welders higher priced; generates tremendous heat to weld all metals. Not a toy welder that uses carbons, but actually uses standard coated rods—sizes 1/16" and 3/32". However, due to Priorities a generous supply of 1/16" rods only are supplied with the welder. Guaranteed not to burn out. Repairs fenders, auto bodies, radiators, machinery parts, etc. Take Victory Model Handiweld anywhere to job, operate right

from light socket. You'll find a thousand uses for this welder around your home, garage, workshop. Also in garages, factories, repair shops, tin shops; mechanics, inventors, plumbers, farmers, etc. Order a "Victory Model" Handiweld now. **SEND NO MONEY.** We'll rush one to you with rods, helmet, operating instructions, and all necessary parts with the exception of a large jar and a small piece of extension cord; these most everyone has. Pay postman only \$1.95 plus a few cents postage. If not delighted return Victory Model Handiweld in 5 days from receipt and money paid for it will be refunded promptly. Rush your order now.

KUMFY PRODUCTS Dept. W-205, Cincinnati 26, Ohio

LEARN ELECTROPLATING—

Complete Instructions by a practical plater, with formulas for Brass, Cadmium, Chromium, Copper, Gold, Nickel and Silver Solutions. Price \$1.00 Money Back Guarantee.

PLATER HYDE, Dept. B, P. O. Box 176, National City, California

CODE SPEED SHORT CUT

Be an expert. Learn to be a Telegraph or Radio Operator. Thousands of men needed. Intensely interesting work—good pay. Learn at home or wherever you are, quickly, easily with the famous Candler Speed System. Book of particulars Free. **CANDLER SYSTEM CO., Dept. 6-H, Box 928, Denver 1, Colo. U.S.A.**



"WONDER" ELECTRIC BUTTON

Most interesting electrical apparatus ever discovered. Make your own Telephone-Amplifier Detectaphone. Transmit your voice or music to distant rooms. Perform hundreds of fascinating experiments. So tiny it can be concealed in dozens of places. Send \$1 now for button and free 5,000 word instruction booklet with 50 illustrated experiments. **SPECIAL OFFER 6 buttons and booklets sent post-paid for \$5. Write now to**

BUCK MFG. COMPANY North Aurora, Illinois



ILLUSTRATED COMIC BOOKLETS

THE KIND MEN LIKE!
(VEST POCKET SIZE)

20 assorted booklets sent for \$1. Shipped prepaid in plain wrapper. No C. O. D. orders. Send cash or money order. No stamps. **GRAYKO, Dept. AB-646 Box 520, G. P. O., New York 1**

HIGH BLOOD PRESSURE A DANGER SIGNAL

Often associated with Hardening of the Arteries, a Stroke, Paralysis, Heart Trouble, Kidney Disease, and other grave complications. Resultful treating methods of the Ball Clinic have proven dependable for nearly a quarter of a century. Send for **FREE Blood Pressure Book** today. No obligation.

BALL CLINIC, Dept. 5160, Excelsior Springs, Mo.



**V-8
DUALS
AND SINGLES**

A genuine steel pack muffler WITH A BEAUTIFUL MOTORBOAT TONE. Sandee Mufflers feature improvements far in the lead, years ahead of competition. Increases mileage and power, reduces back pressure and gives better performance. Savings in gasoline will pay for a Sandee Muffler.

V-8 FORD AND
MERCURY DUALS **\$17.50**

SINGLES—FIT IN PLACE OF REGULAR MUFFLER

Chev., V-8 Ford, Plym., \$5.00 Chrys., Olds., Buick, etc., \$7.00
These mufflers will outlast two regular stock replacements.

Dealers Wanted

SANDEE MUFFLER CO.

7523 S. WESTERN AVE., LOS ANGELES 44, CALIF.

CRAFTSMEN!

We specialize in high grade Foreign and Domestic Woods, Veneers, Lumber, Plywood, Carving Blocks, Marquetry, Inlay Lines and Borders. Inquiries are invited.

Send for free price list.

W. C. GRIFFITH CO.

16 S. Carrollton Ave.

Baltimore 23, Md.



LEARN MOVIE PROJECTION THEATRE MANAGEMENT

The Motion Picture Theatre Business offers big opportunities for trained men. Get into a fascinating field with a peace time future. Train at home in spare time. Free catalog. Established 17 years.

THEATRE INSTITUTE

385 Washington St.,
Elmira, New York

MAKE MONEY CASTING AT HOME FREE FACTS SENT



Make hundreds of Plaster Casts, quick, easy. Sell output to stores, novelty shops, etc. Enormous profits. No experience. Very little capital needed. Start in basement, garage or workshop. Complete, simple instructions anyone can follow. Start now while merchants are begging for merchandise to sell. Rush.

PLASTIC ARTS STUDIOS, R. R. 5, Dept. 44, Muncie, Ind.

New BULL-DOG Tractor Lift

Hay Rake and
Stacker Attachment
Also Available



Replaces Pitch
Forks & Shovels

The BULL-DOG Tractor Lift makes easy, fast moving of manure, dirt, sand, gravel, snow, barrels, etc. Builds ponds. Lifts machinery for loading. Does a thousand jobs on farms, parks, highways. Guaranteed. Write for details.

OTTAWA MFG. CO., 701 Barton St., Ottawa, Kans.

RED-ITCHY SKIN?

watch out—it's often

ECZEMA

**'Invisible'
Liquid
Promptly
Relieves
Torture!**



First applications of wonderful soothing Zemo—a Doctor's highly medicated invisible liquid—quickly relieve intense itching burning of Eczema, Psoriasis and similar annoying skin and scalp irritations due to external cause. Zemo also aids healing. Amazingly successful for over 35 years! Apply any time—doesn't show on skin. First trial of clean, stainless liquid Zemo convinces! Buy Extra Strength Zemo for mean cases.

At all drugstores.

ZEMO

TRAILER BUILDERS' SUPPLIES!

To Build, Repair or Modernize! Save money on Supplies. We are the largest and most complete trailer supply House in the States. Our new large 1944 catalog 10c; Blue prints and building instructions 25c.

National Trailer Equipment Company 719 N. Seventh St. Milwaukee 3, Wis.

FREE!! 40 PAGE HOBBY CATALOG

Over 1000 items — Over 300 Photos

Our new 40 page catalog is the "bible" of wide-awake modelers. Hundreds of models to choose from! Planes, engines, boats, jeeps, tanks, gliders, supplies, etc. Send for yours today!

AMERICA'S HOBBY CENTER

Dept. S75, 40 E. 21 St.

N. Y. 10, N. Y.

AMAZING HANDY ADDING MACHINE

Can Be Carried in Vest Pocket—yet
Handles Totals over
\$9,000,000.00

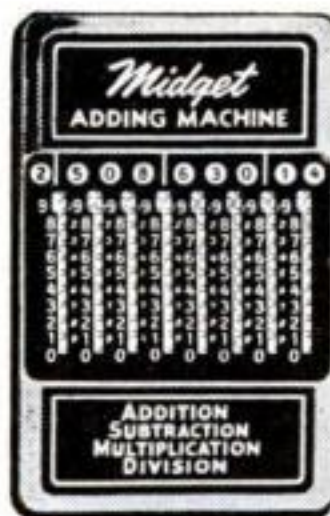
ONLY **\$250** POSTPAID

**ABSOLUTELY ACCURATE
TOTALS INSTANTLY VISIBLE**

Not only adds, but can also be used to Subtract, Multiply, and Divide. STURDILY CONSTRUCTED, with metal front and back, yet weighs only 5 ounces—so that it can be conveniently carried in pocket, as well as used in office, shop and home. . . . Useful to business men, accountants, students, everyone. . . . Worked with a touch of the finger.

SEND NO MONEY

Just send name and address or use coupon below. Then pay postman \$2.50 plus C.O.D. charges on delivery. Or send \$2.50 with order, and we pay all charges—saving you about 50 cents at the new postal rates.



LEE SPECIALTY CO., Dept. PS-12, Box 3620, Mdse. Mart, Chicago 54, Ill.

LEE'S SPECIALTY CO.,

Dept. PS-12, Box 3620, Mdse. Mart, Chicago 54, Ill.

Please send me one of your Midget Adding Machines.

☐ \$2.50 herewith. . . . ☐ Send C.O.D. plus postal charges.

NAME.....

ADDRESS.....

CITY & STATE.....

Now A DYNAMIC HEAVY DUTY INDUSTRIAL WELDER

TO SAVE YOU VALUABLE TIME and MONEY!

This portable DYNAMIC WELDER—easily carried right to the job—plugs into any convenient properly wired 110 volt light circuit—works on IRON, STEEL, BRASS, BRONZE, AND OTHER METALS—has 8 metallic and carbon arc welding heat stages—does work you would think only possible with a larger more expensive machine. Once you see a DYNAMIC in operation, you won't want to be without it. Its simplicity will amaze you. In a year the DYNAMIC only costs you about 6c a day. Helmet, rods, cables, holder and operating instructions, etc., furnished.

DYNAMIC SUPERCHARGED WELDER

DESIGNED TO DO HIGH GRADE WELDING INEXPENSIVELY — Maintenance Men; Farmers; Mechanics; Machine Shops; Foundries; Auto, General Repair and Job Welding Shops; all using the DYNAMIC find it so indispensable and useful that they cannot afford to be without it. If inexperienced, you can easily learn to do a variety of high grade welding jobs by following the practical, simplified operating and welding instructions furnished.

Member of the Chicago Association of Commerce

DYNAMIC WELDER CO. • 13 East 23rd St., DB, Chicago 16, Ill.

FOR ONLY \$23.50 COMPLETE...

Write today for free priority assistance and particulars on how to qualify for one of these amazingly low-priced welders. Act now while they are still available. Get details on our 10 day trial offer.

FARM IMPLEMENTS
BICYCLE REPAIRS
SHOP WORK
HOME APPLIANCES
AUTOMOBILE REPAIRS

120 MILES PER GALLON

Complete motor ready to mount on ordinary balloon-tired bicycle. No mechanical skill required to install. No alteration of bike necessary. Easy to operate. Can be pedalled by merely releasing clutch. Speed 5 to 40 M.P.H. Shipped prepaid complete with 4 cycle, 2 1/2 H.P. motor, all attachments and heavy duty stand. Get complete facts about this low-cost, convenient transportation. . .

Write today for descriptive illustrated literature.

WHIZZER MOTOR SALES CO.

Dept. B, 3132 E. Washington, Los Angeles 23, California

Build the World's Biggest Model Values

26 1/2" Boeing B-29 SUPERFORTRESS. Semi-solid. Line-Controlled. C-D Kit AU-200. **\$1.00**

Biggest \$1.00 Model in U. S.

Soars for hours
Hugo 84" Super CONDOR Soarer. Glider. C-D Kit E-5019, **\$1.00**

★ If your dealer can't supply you, order direct, including 20c extra for packing-postage.

BLACK WIDOW C-D Kit T-155 **\$1.50**

CATALOG 5c (None Free)

CLEVELAND MODEL & SUPPLY CO.

★ 4508 E 66 Lorain Ave., Cleveland 2, Ohio, U. S. A. ★

PLASTICS

TRAINED MEN NEEDED IN NEW, ESSENTIAL INDUSTRY

Plastics is a great new industry and the time to get started in it is now. Opportunities are unlimited. In your spare time, at home, you can prepare to enter this important field. A new, practical training plan is now ready to help you realize your ambitions and win success. Send name and address today for FREE information.

AMERICAN SCHOOL, Dept. PB46
Drexel Ave., at 58th St., Chicago 37, Ill.

City, State.....
Name.....
Street.....

OTTAWA LOG SAW

Put this OTTAWA to work for you. **MAKE MONEY!** Wood is bringing highest prices ever known. Ottawa does more than 10 men. Easily operated. Falls trees—Use 5-hp. engine for other work.

SAWS 10 to 20 CORDS A DAY—FALLS TREES—SAWS LIMBS

OTTAWA MFG. CO., 701 Wood St., Ottawa, Kans.

NAVY VETERANS HERE IT IS!

Your Souvenir Service Ring of World War II! A real beauty and one that you will be proud to wear forever. No. 1213 10K Solid Gold. **\$18.00** Each.

Send for circular showing our complete line of U.S. Army, Navy, Marine and U.S.C.G. Jewelry.

EDWIN W. LANE CO., Dept. PS, 32 W. Randolph St., Chicago 1.

End damp air with "DRI-AIR"

DRI-AIR Chemical absorbs dampness in basements, game rooms, storerooms. Guards against mildew, rust. Kills musty odors. Complete unit \$5.50, f.o.b. Chicago. Get free folder.

TAMMS SILICA COMPANY

Dept. D-118, 228 North LaSalle St., Chicago 1, Ill.

FOOT PAINS STOPPED or Your MONEY BACK

Air-Cooled ARCH-HEELERS

Get Quick Lasting Relief

Wear Guaranteed Proved ARCH-HEELERS in any shoes for aching feet, metatarsal pains, burning callouses, corns, weak arches. Must please you or Your Money Back. Made of selected leather, specially shaped with soft cushions to gently lift bone joints, release nerve pressure, free blood circulation, align entire foot. Springy. Air cooled. Comfortable, even in tight fitting shoes. Users praise them. "I wouldn't take \$5 for mine!" says one. Pair only \$1.

TRY 30 DAYS AT OUR RISK

Heel Cushion
Increases Circulation
Weight Balancer
Metatarsal Support

PAIR \$1

Send No Money Send name, address and shoe size. Pay postman \$1 plus C.O.D. charge. Or save C.O.D. by sending price with order. Money back if not pleased after 30 days. Send Today.

ARCH HEELER CO., Dept. 51-5, COUNCIL BLUFFS, IOWA

SIGNS EASILY AND EXPERTLY PAINTED WITH LETTER PATTERNS

AND SHOWCARDS

MANY SIZES & STYLES WRITE FOR FOLDER!

JOHN F. RAHN

1330-33 N. CENTRAL AVE. CHICAGO 51, ILL.

Classified Ads only 35c per word per insertion, payable in advance. Minimum ad 10 words. White space \$2.00 per line. To be included in August issue, copy should be in our office by July 1st. August issue on sale August 1st.

Beginning with the September 1945 issue prices will be increased to 50c per word per insertion, payable in advance. Minimum ad 10 words. White space \$3.00 per line.

POPULAR SCIENCE MONTHLY—351 FOURTH AVE.—NEW YORK CITY 10

ADHESIVES

MYTEE-BOND Miracle Adhesive. Tried once you'll never be without it. Send 35c. Slomons, Long Island City.

ADVERTISING

ADVERTISING Placed everywhere lowest rates. Reliable guidance on publications, expert assistance on ads without charge. Newspaper, magazine, mailing-list rate-book free. Chicago Advertising Agency, 20-MP West Jackson, Chicago 4.

PRINTERS, artists, draftsmen, anyone, make your own engravings at home. \$5.45 (Simple). Carson Institute, Plainview at Schoolcraft, 23, Detroit.

ADVERTISE: 24 words, 149 newspapers, \$6.50. Lists Free. Advertising Bureau, 4515-P Cottage Grove, Chicago 15.

ADVICE

DRUNKENNESS Is a disease which responds to treatment. Medical skill plus human sympathy prove successful with liquor and drug cases. 60 years experience. Write for free booklet. P. S. Nelson, The Keele Institute, Dwight, Ill.

MAILORDER Business. Your own. Inexpensive, ready to operate. Samples 25c. Deffance, Lefferts, Box 121, Brooklyn 25, N.Y.

AGENTS WANTED

SILVER Plating and Polishing Liquid. Apply with a cloth. A rub-on process, not a dipping method. Cleans, silverplates, polishes, one rubbing. Works wonders on silverware, musical instruments, antiques, brass, copper, bronze, zinc, nickel-silver and german-silver metals, and some others. Over 100 other uses. Distributors wanted to sell to jobbers, retail dealers, agents, salesmen, etc. Details free. NuSilver, Dept. 173, Aurora, Illinois.

SALESMEN attractive proposition, every contact a prospect. Fumigating cap that fits on special clothing bag kills moths and insects, gas penetrates fabric, keeps clothes indefinitely, can also be used for other household articles subject to insect damage, nothing like it on the market, sells on sight. Territory open to responsible people, write attention P.Y. Fumigating Cap & Bag Co., P.O. Box 1588, Baton Rouge, La.

START Your Own Business on our capital. Always your own boss. Hundreds average \$6,000 to \$25,000 annual sales year after year. We supply stocks, equipment on credit. 200 home necessities. Selling experience unnecessary to start. Wonderful opportunity to own pleasant, profitable business backed by world wide industry. Write Rawleigh Co., Dept. G-U-PSC, Freeport, Ill.

CHRISTMAS Cards. Earn big money. Take orders galore from friends. 25 exquisite folders with name \$1.25. Free Sample 10 designs. America's fastest selling 21 Christmas folder box. Costs 50c. Sells \$1.00. Request samples today. Sunshine Art, Dept. N, 115 Fulton St., New York City.

\$1 STARTS you in business. Sell DeLuxe five fold ties. 100% wool interlining. Costs you only \$7 per dozen, you make \$5 dozen. Send \$1.00 for special introductory offer two five fold ties. Catalog complete line free. Philip's Neckwear, 20 West 22nd St., Dept. K-23, New York 10.

MAGIC Races. At touch of lighted cigarette, six horses are off! Watch them Run! 55 Races in mailing carton. \$1.00. Agents Commission, 40%, in dozen lots. Order direct from this ad, or send 10c for sample envelope (5 races) and complete details. Pines, Box 32, Flushing 35, New York.

SKUNKADORA Eliminates 100% All Traces of Skunk odors! Nothing like it. Whirlwind sellers to farmers, trappers, general stores, breeders, etc. Big profits. Send \$1.00 for Sample on money back guarantee or write Sparhawk, Sparkill, New York.

SALESMEN, distributors make big money selling the Simplified Tax-Saver and Business Record. Every individual, business or professional with income other than salary is a live prospect. Sample \$2.00, refundable. The Tax-Saver System, Dept. E, Fort Worth, Texas.

GOOD Paying Business Silvering mirrors, plating autopaarts, reflectors, bicycles, bathroom fixtures, etc., by late method. No tanks or shop required, outfit furnished. Free Booklet, Gunmetal Co., Ave. G, Decatur, Illinois.

MAKE extra money handling magazine orders in your own community! Build your own business. Helps furnished. Big demand. Wholesale catalog Free! Write today. McGregor Magazine Agency, Dept. PS-5, Mount Morris, Ill.

EXCELLENT Sideline for Printing Salesmen. Decalcomania Name Plates in small quantities. Also, make money applying Initials on Automobiles. Free Samples. "Ralco", X-164, Boston (18), Mass.

WHOLESALE: Razor Blades, Laces, Excello, Texide, Silvertex and others. Write for prices and information. National Sales Company, Dept. 114, 1319 Stone Street, Flint 4, Mich.

BIG profits taking subscriptions for all magazines. Agents' Confidential Catalog listing over 2500 periodicals and complete starting supplies Free. Pines Subscription Agency, Flushing, New York.

LUMINOUS pictures that glow in the dark. Large manufacturer wants factory representatives; wonderful new item; fast seller; free sample. Madison Mills, 303 Fourth Ave., N.Y.C.

EVERYDAY Cards. Make \$5.00 with every ten \$1.00 assortments you sell. Also Conversation Notes. Unusual Demand. Send for samples to-day. Howard P. Ellis, Dept. PS, Pitman, N. J.

MAGIC Races—At cigarette touch six horses are off. Fast seller. Big profits. 40 Races \$1.00. Dime brings samples, wholesale prices. Barkley Co., Dryden 5, Virginia.

MAGIC Cleaner and laundry soap deal. Hotter than a firecracker. Big profits! Sample free. Uco, 5007 Irving Park, Chicago.

LICK After-war layoffs: Start own business; home, office. Booklet describing "Collection of 127 Tested Plans" free. Elite Co., 214A Grand St., New York.

FREE Water and our concentrates makes flavors, lotions, shampoos. 72 products, labels, bottles furnished. Qualco, P-20030 Russell, Detroit.

100 CIGARETTE Rollers, \$20.00; Dolls, dozen \$12.00; Pencils gross \$1.95; Aspirin, gross boxes, \$1.99. Send payment. Catalogs free. Mills Sales, 901 Broadway, New York 3.

LUMINOUS Paint, (Shines in Dark). Spectacular seller to millions. Write for profitable details and free sample. Lite-Saver, 97B, Saybrook, Conn.

AGENTS. Everyone wants beautiful 12 by 16 Honor Scrolls of loved ones. Retail \$1. Sample at wholesale 40c prepaid. Particulars, Condon, Box 157, Upper Darby, Pa.

\$1.00 TRIAL Order 100% Profit. Big Demand. Play-At-Once Keyboard Sheet Music, 840PS N. Michigan Ave., Chicago 11, Ill.

DISTRIBUTORS' Harvest! Sell Ex-O-Lene! Powerful gasoline mileage stretchers. Goes like "Blue-Streak"! Extremely Profitable. Thermopower, Peoria 4, Ill.

200 MONEY Making Ideas, Plans, Rare formulas, Schemes, Exposed secrets. Particulars Free. Formico Co., Box 572, Dayton, Ohio.

PHOTOS 3-25c. Adults assortment 50c. Haller Mailaddress Service, 436 N. Y. Ave., Brooklyn 25, N. Y.

GOLD Lacquered Window Sign Letters. Beautiful Large Sizes, Penny each. Free Samples. Atlas, 7941 Halsted, Chicago.

PROSPECTS. Every car owner. Sells for \$1.50, costs you 39c. Quarter brings sample. prices. Barkley Co., Dryden 33, Va.

\$3 FIRE Extinguisher sells wholesale or direct. Fire-Killer, 97 Franklin, Syracuse, New York.

AIR CONDITIONING

EVAPORATIVE Air-Cooler. Window type. Instructions, diagrams, photographs, information \$1.50. Pete Pratt, 1024 D. St., Marysville, Calif.

ANTIQUES, RELICS, INDIAN GOODS

SWORDS, rapiers, daggers, pistols, armor; illustrated catalog, 25c. Robert Abels, 860 1/2 Lexington Ave., N. Y.

ARROWHEAD and lists. Indian relics, 15c. Williams, 212 1/2 Pine, Green Bay, Wis.

ARCH SUPPORTS

BIG Profits manufacture custom made arch supports. Particulars, Julia Corssen, 2638 Geyer, St. Louis 4, Missouri.

MIRACLE Arch Support Plastic Custom made. Unbelievable Foot comfort, indestructible. Impression material free. Archcraft Co., 600 W. 164th St., New York 32, N. Y.

AUTOMOBILES

MOTOR Books. "Power and Speed."

World's famous racing automobiles, motorcycles illustrated, described. Engine information, cams, valves, superchargers, compression, etc. Foreign drivers, cars shown. Grand Prix race information. \$2.50

Ab Jenkins' new racing book describes Mormon Meteor, world's records, Bonneville, Utah Salt Flats, \$1.50. Auto Racing Photo Album. Action photographs famous racing drivers, cars. \$1.50. Famous Racing Motorists. Sir Malcolm Campbell's book of foreign races, his experiences. \$2.00. Motor History of America, world's wonder book automobile history. 416 pages, lists 1500 makes cars. \$3.00. All postpaid anywhere U.S. or overseas. America's most complete catalog Motor Books 10c. Clymer, 2125 W. Pico, Los Angeles 6, Calif.

CLYMER'S Motor Scrapbook. A "must" says Time Magazine. Illustrates, describes hundreds early gasoline, steam, electric automobiles, motorcycles. Includes experiences and fascinating, amusing story by the author, Floyd Clymer, one-time world's youngest automobile dealer. Editions one and two available \$1.50, each different. DeLuxe cloth bound either edition \$2.50 each. Overseas orders solicited. All postpaid. America's most complete catalog Motor Books 10c. Clymer, 2125 W. Pico, Los Angeles 6, Calif.

ARE Steam Automobiles coming back? Many think so! Book "Modern Steam Car," 160 pages, 100 illustrations. Dobbe, White, Stanley, others. Specifications, photographs early and latest steamers. Tells how operate steamers. Data boilers, engines, burners. Postpaid \$2.00. DeLuxe cloth bound edition \$3.00. Send 25c for folder listing 90 makes early steamers. Photos, racers, interesting, educational, ancient steamer information. Clymer, 2125 W. Pico, Los Angeles 6, Calif.

MOTOR History of America. World's wonder book automotive history. 416 pages with supplement by Floyd Clymer. 150 illustrations. All early automobiles. List over 1500 one-time automobile manufacturers in America. Postpaid \$3.00. DeLuxe cloth bound \$4.00. Clymer, 2125 W. Pico, Los Angeles 6, Calif.

AUTOMOBILE Racing Book. Fifth Edition—Revised. Tells how to build dirt track bodies, frames, engines. Records, superchargers, rules, formula, plans, stock conversions, roadster racing, fast Fords. \$1.00 postpaid; \$1.15 C.O.D. Ray Kuns, Department 274, Madisonville, Cincinnati, Ohio.

UNIVERSITIES and Oil Corporation tests prove Whirlgas Turbinator, \$3, increases mileage and horsepower. Users report savings high as 40%. Wrench installs 15 minutes. Give auto make, year. John Hanley, 5719 Loraine, Detroit 8, Mich.

AUTOMOBILE Racing Photo Album, 110 exciting photographs record cars, drivers, crashes. Famous tracks illustrated. Postpaid \$1.50. Clymer, 2125 W. Pico, Los Angeles 6, Calif.

MOTOR Books. Most complete automobile, motorcycle selection in America. Historical, technical, racing. Send dime for book catalog. Clymer, 2125 W. Pico, Los Angeles 6, Calif.

CUSTOMIZE your automobile. Illustrated new restyling ideas, instructions, specific model changes by simple methods. \$1. Speedwheel, Box 723-C, Arcadia, California.

1945 IGNITION Supercharger, \$4.00. Pep. Mileage. Fast Starting. EG Mfg. Co., 355 E149 St., New York.

AUTO SUPPLIES & EQUIPMENT

NOW! Water injection for your car! Closest approach yet to the actual installation on fighter planes, and we are making it possible for you to share the spectacular benefits, any make or model. Increase power and mileage up to 30%. Decrease carbon and engine wear. Developed and proven under engineering supervision. Anybody can make installation at Very Low Cost and with minimum tools. All parts available to civilians. Wonderful opportunity postwar and Now! Complete plans and instructions, only \$2.00 cash, check, or money order. Hughes Engineering Laboratory, 1020 Jefferson, Evansville 14, Indiana.

AMAZING new Moto-Vator injects water-vapor into motor just like newest fighter planes. Burns 15% water; saves 20% to 30% gas; Prevents Carbon; Increases power! Eliminates carbon and valve jobs. Not a gadget. Sensational performance keeps motor like new. Wonderful postwar possibilities. No investment. . . . One low price includes license to install Moto-Vator in your locality. Send 10c for booklet giving complete details. Dept. S. SX Laboratories, P.O. Box 37, Middle Village, Long Island, New York.

R AND R Mfg. Co., Box 546, Marine Division, Anderson, Indiana. Speed and Power Equipment. Hicompression cylinder heads Dual intake Manifolds Camshafts Pistons Ignite Flywheels for V-eight and Model A Fords. Air Pumps Gauges Tachometers Autopulses. Special Literature \$1.00.

CONVERT your auto, tractor or marine engine to burn diesel or stove oil. Proven factory method. Different and better. Costs nothing to investigate. Write for free circular No. 3. Harrington Co. 222-224 S. W. Stark St., Portland 4, Oregon.

HAVING Car Trouble? New, Used, guaranteed auto, truck parts save money. Transmission specialists. Describe needs; immediate reply. Victory, 2439-1/4 Gunnison, Chicago 25.

UNLOCKEEZ is a Patent Pending device, guaranteed to open any push button Auto Lock instantly. \$2.00 per unit. Unlockeez Lock Device Co., Box 2889, Los Angeles 54, Calif.

BIG box, 10 lb. box, of over 3,000 popular size assortment of steel bolts, nuts, screws, washers, cotter pins, hose clamps etc. \$5.00 postpaid. Meltz Aircraft, Hardware Dept., New Brunswick, N. J.

WE carry Moto-Scoot parts for Lauson and Briggs-Stratton motors. Write for folder on new Amco Centrifugal clutch. American Moto-Scoot, 1319 W. Carroll Ave., Chicago, Ill.

OIL Pumping Motor—brought back to normal without ring job. Prolong Life of motor. Use car immediately. Information \$5.00. Joe Mullner, Box 3102, St. Paul, Minn.

NEED Auto or Truck Parts? New, Used. Guaranteed transmissions, motors, etc. Complete line, save money. National, 4056 N. Kedzie, Chicago 18, Ill.

INVENTION Uses kerosene to run motors. Circular on plans. Rush name. Houston Maupin, Tipp City 37, Ohio.

PRESERVE your tires with plastic and puncture-proof your tires. Details for stamp. Betke, Box 699, Borger, Texas.

AUTO TRAILERS

BUILD your own Trailer! Save Money! Have every feature you want! Plans for House, Sport, Camp and Utility trailers. Catalog describing 9 models 10c. (15c in Canada and overseas) Jim Dandy, Box 125-B, Wausau, Wisconsin.

AVIATION

NICHOLAS-BEASLEY Monoplane \$150; airplane motors \$45 up with propeller. Send 25c for War-Bargain catalogue listing hundreds of buys in airplanes, motors, crackups, salvage, located everywhere, some probably near you. (35c by first class mail). Used Aircraft Directory, Athens, Ohio.

PROPELLERS—Quality—Service—correct size for any motor. Including Airliner 3-blade for boats, sleds, orchards, Hydrators, 2 blades for airplanes. Aircool conversion diagrams Ford motors 50c. Standard Aircraft, Ft. Worth, Texas.

JET Propulsion. Know jet propulsion. Build your own units for model airplanes. Get complete data, drawings, design charts. Only 50c. Technical Press, Box 951E, Salem, Mass.

TAYLORCRAFT \$350, Aeronca \$175, Cub \$500 (just overhauled). Catalog—over 350 aircraft bargains—25c. Used parts, parachutes, listings included. National, Box 1682-CS, Toledo, Ohio.

JET Propulsion Experiments. New principle to drive boats, bicycles, model helicopters. Circular on plans. Rush name. Houston Maupin, Tipp City 54, Ohio.

AVIATION INSTRUCTION

PAN-AMERICAN Academy of Aeronautics, 2300 W. Flagler, Miami 35, Florida. Teach Aircraft Drafting, Engines, Instruments, Radio Navigation better, cheaper. Approved Pre-Induction and Industrial Training Center for Men, Women.

BATTERIES, GENERATORS, ETC.

BATTERYLIFE doubled. Guaranteed instructions \$1.00. Betke, Box 699, Borger, Texas.

BLUE PRINTS AND PLANS

POSTWAR Home Planning Kit, 17" x 22" Layout Sheets for Floor Plans. Landscaping and House Ideas. Furniture Cut-outs. Decorating Charts. Budget Sheets. Architects Symbols. Complete Kit of materials to plan your postwar home. Practical. New. More fun than a Scrapbook! Complete Kit \$1.00. Red Lion Press, Golf 3, Illinois.

RECORD Player; Plays thru your radio; Simple and easy to make. Detailed plans and instructions only \$1.00. Jay-M Sales Company, P.O. Box 97, West Haven 16, Conn.

BOATS, OUTBOARD MOTORS, ETC.

FULL size, cut to shape boat patterns, blueprints, 7 1/2—38 feet. Illustrated "Build a Boat" catalog, 10c (coin). "How to Build Boats" book, \$1.00. Cleveland Boat Blueprint Co., Dept. A-77, Cleveland, Ohio.

MAKE 16' Rowboat. Blueprint, 30c. Wee-Sho-You, Box 51, Detroit, Michigan.

BODY-BUILDING COURSES

BAR-BELLS, Dumbbells. Exercise equipment. Courses. Special offers! Free booklet. Good Barbell Co., 3261-PS Watson, St. Louis 9, Missouri.

PHYSICAL Perfection Course \$1.00 (Guaranteed). Sid's System, DPSM, South Gate, Calif.

BOOKS, PERIODICALS

100,000 POST-WAR Jobs abroad—South America, China, India, Burma, Japan, Russia, Malaya. How and where to apply now. Post-war U. S. participation in world reconstruction and trade demands thousands of American-trained mechanics, salesmen, technicians, engineers, foremen, laborers and business representatives—every trade needed. Our 15,000-word copyrighted forecast—compiled from business, professional and government sources—lists over 200 big U. S. firms with foreign interests, gives job information, salary brackets, contract tips, application letters, passport information, climatic conditions, etc.—vital facts for your immediate application. \$1.00. Return for refund in 7 days if not satisfied. Pacific Industrial Research Bureau, 202-D Studio Building, Portland 5, Oregon.

HYPNOTIZE Anyone! Step by step the secrets of hypnotism are revealed to you so you can hypnotize people easily. Think what this can mean to you. 284 pages of clearly written, practical instruction. No detail overlooked. Start mastering other people right away! Send for "Practical Lessons in Hypnotism" by Dr. William Cook. Only \$2.00. Ball Square Company, Dept. 55-E, 697 Broadway, Somerville 44, Mass.

"RUTHBELLA"—Diary by Sansicchi. Excitingly rapturous love story. The book you have been looking for—insidious, alluring. In two picturesque editions: DeLuxe "Private Library" Edition—\$5; handy "Victory" Edition—\$1. Mailed in plain wrapper, postpaid. Remit now, limited supply. Dealers accommodated. Poets Corner Press, Publisher, Dept. 56A, 308 Third, Palisades Park, New Jersey.

MAGAZINES—Business, Vocational, Diver-sion. Profit by keeping posted on conditions, developments and opportunities in your line through magazines devoted to it. Choose current single copies you need from our list covering more than 200 fields. Write now for free price-list. Commercial Engraving Publishing Co., 345 N. Ritter, Indianapolis 1, Ind.

THIS IS IT!! Photos-posed by artists models and show girls, in unusual tantalizing poses. These breath-taking photos are finest quality glossy prints, which give each photo sparkling lifelike appearance. Send \$1. and receive 24 luscious pocket size photos postpaid. Irving Klaw, 212 E. 14 St., Dept. G, New York City 3.

15 SCENES of Life in the South Seas. Has 11 Actual 3 1/2 x 5 close-up photos of Native Girls attired only in grass skirts. Taken in the Wilds of New Guinea by a "Seabee" now serving there, \$1.00 postpaid. Mrs. Beatrice Bachand, 7 Potter Pl., Dept. 21, North Adams, Mass.

PIN-UP Dream Girls—for adults only, un-retouched, actual glossy photographs 4x5, 12 Luscious Beauties in each set, \$1.00 postpaid. 20 Exciting Sets Available. Free Catalog full of Daring Pictures with order. DeLuxe Photo Service, Box 953, Dept. D1, Church St. Annex, N. Y. 8, N. Y.

PIN-UP—Eyefuls, Beauties in cosy poses. Glamorous. Bewitching. Feminine curves. The real thing—15—4 x 5 approximate size. Each one different. These are exciting pictures of models for adults only. Send \$1.00. No C.O.D. money order or stamps. Lin, 19 W. 27 St., New York City.

ADULT Books—gift coupon Free. R. Sullivan, 61-49 56th St., Maspeth, L. I.

OPERATE Profitable Agency taking subscriptions to all magazines, complete supplies and wholesale catalog listing 5000 magazines 25c (Refunded first order). New York Circulation Service, 30 Church St., New York 7

PIN-UPS. Gorgeous Girls adults only, fascinating luscious, real photographs, 64 assorted \$1.00, 30 assorted 50c; 15 candid poses, 3 1/2 x 5 \$1.00, 6 for 50c, other sets available. Hirsch, 119 W. 33rd St., Dept. J, New York 1, N. Y.

EDUCATIONAL Books sold cheaply or rented for small fee. Books bought. Money back guarantee, 4,000 Bargains. Catalog Free. (Courses Bought). Lee Mountain, Pisgah, Alabama.

MAGAZINES (back dated)—foreign, domestic, arts, Books, booklets, subscriptions, pin-ups, etc. Catalog 10c. (refunded). Cicerone's, 863 First Ave., New York 17, New York.

MOTOR Books. Most complete automobile, motorcycle selection in America. Historical, technical, racing. Send dime for book catalog. Clymer, 2125 W. Pico, Los Angeles 6, Calif.

MODERN Steam Car \$2.00. Floyd Clymer's Historical Motor Scrapbooks \$1.50 postpaid. See our advertisements under Automobiles and Motorcycles. Clymer, 2125 W. Pico, Los Angeles 6, Calif.

FREE Pin-Up (9 1/2 x 7 1/2) of a Luscious model in full colors and our latest price list. Offer limited. Send for yours today! Ball Square Co., Dept. 1-E, 697 Broadway, Somerville 44, Mass.

ARTISTIC Girl photos. Real models, 43 for \$1.00. Size 3 1/4 x 5 1/4. 20 Classic pictures Free with each order. Adults only. Charles Scott, P.O. Box 342, Covington, Ky.

BOOKS, (out-of-print, new, used) quickly supplied, many 35c bargains. Catalogue. Mid-West Book Service, 18870 Marx Ave., Detroit 3, Michigan.

HIGHLIGHT headlines of World War II. Souvenir photographs of newspapers. Sample ten for dollar. Adams, 204 Williams, Huntsville, Alabama.

SAVE money by writing for our lists of special cut-rate books, many at less than 50% of original price. Pines, Box 32, Flushing, New York.

FREE Book Catalog. Five Hundred Un-usual, Interesting Books. Happiness Books-PSF, 41 Union Square, New York 3, N. Y.

BOOKFINDERS! (Scarce, out-of-print, Curious Books) Supplied promptly. Send wants. Clifton, Box 1377ps, Beverly Hills, Calif.

12 PIN-UP greeting cards, snappy photo poses, clever sentiments, newest sensation. Only \$2.00 postpaid. Fraser, 215 D Montague, Brooklyn 2, New York.

14 DIFFERENT dates: Love, Mechanix, Radio, Aviation, Coronets, Science, or Comics \$1.00 (Free List). Voronow, 343 E. 23 St., New York.

FREE Booklet—The Truth About Jesus. John C. Meek—P.O. Box 512—Baltimore 3, Md.

BEAUTIFUL Girls. Pin up pictures. Attractive poses. 24 for \$1. United Arts, 2309-P Lawrence, Toledo, Ohio.

FREE bargain catalogues. All subjects. National Booksellers, 1182 Broadway, New York.

PIN-UPS. Better quality, no junk, 5 x 7 Full color beauties. 24 for \$1.00. Plastic's, Route 5, Muncie, Ind.

OZARK Magazine, Lonsdale, Arkansas. For homeseekers, sportsmen, folklorists. Year, \$1.00.

UNUSUAL Pin-Ups! Real Photographs! 10—\$1; 25—\$2. Fine-Arts, Box 2084, San Antonio 6, Texas.

ADULT books. Living illustrations! Sample 25c. 3 assorted: 50c! 7 assorted: \$1.00! Free lists. Hirsch, Spring Valley 3, N. Y.

ADULT Books. Sample and catalog 10c. Alstone, 310 Lunenburg, Mass.

MAKE 70 life's prime. Bookmaster, 104B Orchard Lane, Stillwater, Okla.

PRETTY girl Photos, Large selection \$1.00. Judy Sellers, Box 123-Terre Haute, Ind.

BOOK Bargains. Illustrated catalogs free. Rialto, 349-A Sackett, Brooklyn, N. Y.

"A RATIONAL View of Life"—\$1. Benjamin Seibert, Urbana, Ohio.

ADULT Books—Catalog. Sample 25c. Le-favor, Box 229, San Bernardino, Calif.

BUILD IT YOURSELF

AUTOMOBILE mechanics cash in on this. Build tractors from second hand automobiles. Convert horse drawn farm equipment into tractor hook-up. Nolan's Garage, East Wareham, Massachusetts.

ELECTRO-Magnetic Cannon! Touch button, it shoots steel shell. You can build it! Illustrated instructions 25c. Kit of parts, postpaid \$2.00. Robert Hulet, 29A East 39, New York.

RADIO control equipment. Control models—doors, etc. by radio. Send 25 cents for Instruction Manual to Radio Control Headquarters, Box 214, Deal, New Jersey. No stamps.

BUILD new post-war home yourself. Save up to 60%. Nationally approved. Informative circular free. Soldiers especially notice. William Jackson, B.A., 1713 Howard, Port Huron, Michigan.

PLASTIC Houses—Build yourself! Resurface old buildings! Wonderful building material. Write Marbleizing Service, Edwardsville, Ill.

BUSINESS OPPORTUNITIES

MAKE new USA patented toys in your work shop. Lathe required. Pay small royalty. Year around seller. Self advertising. They sell like yoyos. Your ticket to prosperity. Send \$1.00 for blue prints and proposition. People are toy hungry and stores are empty. Act now. Clinton Davidson, 636 "C" St., San Diego 1, Calif.

LIQUID Marble; snow-white, multi-colored. Glazed. Unglazed. Composition Flooring. Lifetime wear. Any color. No priorities. Flexible molds. Plaster casting. Get into the big money now. Full information given free. Write—Compo-Tex, Box 786-F, St. Louis, Mo.

THOUSANDS of Alarm Clocks need repairing. Jewelry stores swamped. Our simplified course with pictures and drawings teaches you how to repair these clocks. Necessary tools and supplies furnished with course. Alarm Clock Repair Service, P.O. Box 1983B, Houston 1, Texas.

COLORGLAZED Concrete Pottery made without molds. New, low cost, patented method. Cemetery products, novelties, tiles, floors, etc. Basement leaksealing. Other money-making projects. Booklet, details free. Men only. National Potteries, Fergus Falls, Minnesota.

MECHANICALLY Inclined Men—Own and operate general Appliance Repair shop. Complete, illustrated course shows you how. Welding, Refrigeration, Motor repair. How to get business, etc., all phases covered. Free literature. Christy Supply, Dept. 753, 2835 N. Central Ave., Chicago.

MONEYMAKING Opportunity in Used Machinery Sales Agency. Very little capital to start. No selling. Others sell for you. Excellent Post-War possibilities. Complete plan, letters and advertisements \$1.00. Gilman Roberts, 425 Beech St., Arlington, New Jersey.

JACKPOT Fruit reel machine \$55.00. Coin operated. Automatically pays out quarters or tokens. Ideal for recreation rooms; or establish routes in public places. Write for circular. Webb Distributing Co. 612 N. Michigan Ave., Dept. 34, Chicago 11, Illinois.

COLOR Concrete with Chemicals. Big money making Hollywood style pottery, birdbaths, without moulds. Wishing-wells, stucco-rock, benches. Marbling, cement water-paint. 10c brings sample, literature. Pictures. Hollywood Cementcraft, 8530 Wonderland, Hollywood 46, California.

GOOD Paying Business Silvering mirrors, plating autotaps, reflectors, bicycles, bathroom fixtures, etc., by late method. No tanks or shop required, outfit furnished. Free Booklet. Gunmetal Co., Ave. E, Decatur, Illinois.

MAIL Order Business course shows you how to make money, spare or fulltime. Teaches professional mail order technique—not penny-snatching schemes. New Success-Catalog Free! Write—Nelson Company, Dept. 4-01, Chicago 4.

START Home business making statuary, plaques, art goods, pottery, garden furniture, artificial marble flooring, liquid marble. Make flexible molds yourself. Amazing profits. Folder free. Creative Publishers (PS7), Glencoe, Illinois.

START a clock shop while clock repairing is booming. Our easy to learn home study course with pictures and illustrations teaches you how to repair all kinds of clocks. Information free. Houston Clock Shop, P.O. Box 5096B, Houston 12, Texas.

WANT to make \$1.00 weekly: No foolin'. Details and 64 page book of moneymaking information, that can mean immediate Cash and your future independence 25c postpaid. Write today. Now. Wilkin, 1348-P N. High, Hillsboro, Ohio.

MAILORDER Selling to Latin-America is your golden opportunity. Virgin, over-prosperous market. 130,000,000 potential buyers. Three special instructive folios, \$1.00. Descriptive literature, 3c. Vallesm, 395-JM Broadway, New York 13.

START Mailorder Bookshop—Everything furnished; publisher cooperation. 25c brings booklet, exclusive setup, samples, exciting ideas. General Publications, Ossining 1, New York.

PLASTICRAFT—Real synthetic resin easily cast in simple molds. Quick curing. Quarter pound with instructions \$1. Quantity prices. Plastics Digest, 3937D Tracy, Kansas City 4, Mo.

LEARN how to make lots of extra cash selling "information" by mail! Write today for free details. Postcards welcome. Hillard Hotteway, 349-B Sackett St., Brooklyn 31, N. Y.

LEARN Profitable Credit and Collection Agency Business: Earn \$5000-\$10000 annually upwards; Postcard Brings Interesting Literature Free; Write Educational Extension Service, Dept. 103, Los Angeles 36.

POSTWAR advertising business of your own if you can sell. Small investment. Money, Travel! Full instructions \$3.00. C. J. Thomas, 1635 Penn St., Denver 5, Colorado.

PLASTICRAFT—Real synthetic resin easily cast in simple molds. Quick curing. Quarter pound with instructions \$1. Quantity prices. Plastics Digest, 3937D Tracy, Kansas City 4, Mo.

HEALTH first! New Drugless Method. Unbelievable results! Operate a "Health Conditioning Club." No apparatus. Metabolic System, D9128, Station S. Los Angeles.

SELL Cosmetics By Mail. Women spend millions on Beauty. You can make your share of this Cosmetic Money. Let us show you how. Details Free. Frank J. Artz, 1060 Harding Drive, Toledo 9, Ohio. Dept. B.

START Home Business making Novelties, Plaques, Souvenirs. Colorful Liquid Marble. Make your own Flexible Molds. Write for Free Information. Bing Products, 621-I Tremont St., Boston 18, Mass.

MAKE Extra money at home! Thousands do! Booklet "How to Sell by Mail" sent postpaid for 25c. Wall, 143-B N. 6th St., Reading, Penna.

TYPEWRITER Repairing—Original Course—Simplified Home Study. Weber Typewriter Mechanics School, Box 269, Osborn, Ohio.

OPERATE home mail order business. Permanent. Profitable, get established now. Charles Church, 814 N. 24th St., Billings, Montana.

IMPROVE your job or business. Read the "inside" trade magazines. Profit by knowing "how" and "where". Lists free. Dunbar, New Brunswick 3, N. J.

SELL Christmas Cards, Display Signs, Pictures, Calendars, Books, Greeting Cards. Big Profits! Quick Sales! Catalog Free! Elfco, 436 N. Wells, Chicago.

MY Spare Time Mail Order Business grew into over \$100 weekly profit. I'll teach you! Preface lesson 25c. James Stone, 402 McLain Bldg., Wheeling, W. Va.

MAKE strange new plastic, 8c gallon—sells 50c. Makes beautiful, durable floors, walls, roofs. Amazing profits. Bays Laboratory, Oklahoma City 9.

BECOME a paint manufacturer. Start with your garage a factory. No equipment capital needed. Industrial Chemist, 1826 60th, Kenosha, Wisc.

INVESTIGATE Mail Order Selling. Dime brings helpful 50-page mail trade monthly describing successful plans, formulas. Young Publications, Kent 16, Ohio.

LOOKING for Idea? Buy Appleton's Patents Bulletins, \$1.00. Subscription, \$9.00. Monthly listing lapsing patents. Station N, Box 63, New York.

PLASTICS Guide-listing dealers in materials, molds, supplies, machines, equipment, accessories. \$1. Plastics Digest, 3937D Tracy, Kansas City 4, Mo.

GO into Rug and Upholstery Cleaning and mothproofing business for yourself. Free course shows how. Marvella Co., Burt Bldg., Dallas, Texas.

START your own business, full or part time. Experience not essential. Details Free. Business Plans Foundation, P.O. Box 56E, New York 10, New York.

WE start you in business at home spare-time. Earning \$10-30 weekly, selling by mail. Joseph Driscoll Sales Service, Box 2771G, Denver, Colorado.

"HOW to Make Simple Molds and Plaster Plaques". Profitable Business or Hobby! Booklet 25c. Plastercraft, 1406 E. 43rd St., Cleveland 3, Ohio.

LIQUID Marble—Marvelous, colorful. Brushed, sprayed, molded. Rubberlastic molds! Composition Flooring! Particulars free. Marbleizing Service, Edwardsville, Ill.

GROW Dwarfed trees. Instructions 25c. McGuire, P.O. Box 628, Dept.-E, Seattle 11, Washington.

SELL by mail, promote your own proposition and have others selling for you. Particulars Free. Harry Dean, Box 900, Galveston, Texas.

BUILD Own Business Mailing penny post cards; six profitable plans with all information for starting. Gordon Publishers, Box 23, Pawtucket, R. I.

GET Ready for Own Postwar Business making Venetian Blinds. Illustrated Instruction Book \$1.00. Elwert, 6900 N. Ashland, Chicago 26.

MOLD-MAKING, Plaster casting. Money-making Business. Literature Free. Kemilo, Park Ridge, Illinois.

\$24,500 RICHER: Used "Schemes" from "Schemer" Magazine. Alliance, Ohio. 47th year, \$1.00; 3 months, 25c.

MONEY in Mushrooms. Instructions—Spawn \$1.00. Particulars 10c. Houck's, Tiffin, Ohio.

MAIL Order Opportunities. Free copy. Drop Postal Today. Blackstone, Somerville, New Jersey.

\$2,000 YEAR sideline easy, inventing simple items for guaranteed cash markets. Hendrixon, Argyle, Wisconsin.

1,500,000 ARTICLES wholesale. Scarce merchandise. Directory 10c. Prince, Sunnyside P. Indianapolis 44, Ind.

RUBBER Moulds, Latex, models, start profitable business. Eastern Latex Laboratories, Box 153, Mattapan 26, Mass.

QUICK Money. Repairing car Batteries at home. Easy too. Write. Batteryman, 901 South Ave., Grand Junction, Colorado.

YOU too can learn how to make, mold and cast Real Plastics. Send stamped envelope. Box 498, Gainesville, Texas.

TURN accounts into cash. Good income; quick results. National Collectors, Newark, Ohio.

LARGE Profits Merchandise Imprints available. Write, Adams Exchange, 150-S W. 124th St., New York 27, N. Y.

GRIND Lawn Mowers! Guaranteed income! \$3.50 investment. Mowers, Janesville, Wis.

WHOLESALE Directory Ten cents. Volchok, 1098 S. Gerard Ave., New York 52.

SELL Pin-Ups, books, novelties, etc. Martins, 61-49 56th St., Maspeth, N. Y.

BUSINESS SERVICE

MAIL Address Service \$1.00 Monthly Letter 10c. Spada, 10 Lexington, Wethersfield 9, Conn.

CHICAGO mail forwarded. Confidential. 25c per item. Blair Service, 4520 Sheridan-40.

CAMERAS, PHOTO SUPPLIES

BASS Says: War time proves Bass leadership. Amazing selection of finest still cameras—Leica, Contax, Korelle, Reflex, Argus, new and used still available. Write for quotations. Satisfaction guaranteed or your money refunded. Bass buys 'em, sells 'em, trades 'em. 35c Postpaid for 100 page book "Military & News Photography" by Jack Price. Up to the minute information. Bass Camera Co., Dept. SP, 179 W. Madison St., Chicago, Ill.

AMATEUR Photographers attention! Improve your hobby of picture taking and learn how to make money with it. Write today for our 40-page book catalog and a sample copy of American Photography, enclosing ten cents for postage. Contains articles and pictures of the world's foremost writers and pictorialists. Camera House 141, 353 Newbury St., Boston, Mass.

CASH! Spot cash for cameras, lenses, binoculars, movie or still, sound projectors. Send full description by mail, or wire for prompt cash offer. Over 30 years of dependability insures honorable dealings. 35c Postpaid for 100 page book "Military & News Photography" by Jack Price. Up to the minute information. Bass Camera Co., 179 W. Madison St., Chicago, Ill.

WAR-BARGAIN Used Cameras. Candid Camera \$4.98, Kodak \$7.00 Graflex \$27.50, Enlarger \$15.00, 35mm, Reflex Cameras—and many others. Movie camera \$5.00, Projector \$8.00, Roll Film. Send 25c for latest list and descriptions. Used Camera Directory, Box 1031-K, Canton, Ohio.

PHOTOGRAPHY for pleasure or profit. Learn at home. Practical basic training. Long established school. Write for booklet. American School of Photography, 1315 Michigan, Dept. 1722, Chicago 5.

CANDID Camera Build Your own Kit of Parts \$3.50. Easy assembly Plan Free. Hollycam Co., Box 272-C, La Jolla, Calif.

CARTOONING, SIGN PAINTING, DRAWING

POCKET Size Cartoon Course—22 Easy Lessons, over 200 sketches including figures and lettering. Prepared by nationally known artist. Mailed postpaid on receipt of 25c in coin. Snack-Pack Co., 32 E. Georgia St., Indianapolis 4, Ind.

CARTOONING—Learn at home. 14 easy lessons. 50c. Cartoon Studio, 1402 Charles, La Crosse, Wisconsin.

LEARN To draw funny faces. Write, Funny Faces, Modesto 1, Calif.

CHALK TALK STUNTS

CHALK TALKS. Laugh Producing Program \$1.00. Illustrated Catalog 10c. Cartoonist Balda, Oshkosh, Wisconsin.

CHEMICALS & APPARATUS

CHEMISTRY Laboratory apparatus and chemicals for industrial, analytical, and experimental laboratories. Complete supply service for students taking correspondence school chemistry courses. Send 3c postage for free 44 page catalog. Dept. M26, Biological Supply Co., 1176 Mt. Hope Ave., Rochester 7, N. Y.

THE House of Winn, the Home of Supplies for Amateur Chemists. See Winn's new idea Chemical Kits and Apparatus Outfits for Home Experimenting. Send 10c for Retail Catalog. John H. Winn, Established 1931, Dept. 607, 124 West 23 St., New York 11, N. Y.

BALANCE Weights. Precision Quality. Range: 1 Centigram to 50 Grams. 16 Weights in hardwood box with hinged cover. \$3.75 Postpaid, including illustrated instructions for building precision balance. Hallmark Technical Supply Co., Jamestown, New York.

NEW 32 page Chemical Apparatus Order Book. Complete line of Chemical Glassware, Apparatus and Chemicals. Send 10c for this book. Standard Science Supply Co., 1232 N. Paulina St., Chicago 22, Illinois.

HANDBOOK for Chemical Experimenters. Hundreds of experiments; illustrated; 50c. Experiment Booklet, 15c. Chemical Catalog, 5c. Reading Scientific Co., Reading, Pa.

LABORATORY Supplies at Wholesale Prices: Chemistry, Biology, Physics. Catalogue, 10c. National Scientific Co., 2204 W. North Ave., Chicago. Established 1908.

ULTRA-VIOLET Fluorescence lamp, apparatus, chemicals. Complete kit. Directions \$3.98, delivered. Kem-L-Kit, Middletown, Ohio.

LUMINOUS Paints will glow in dark. Six colors. Fairmount Chemical Co., 136 Liberty St., New York City 6.

CHEMICALS, ounce quantities. Apparatus. Catalog 5c. Fleischer's Laboratories, Everett 49, Mass.

FREE particulars. Amateur Scientists' Magazine, 45 N. Evergreen-L, Memphis 4, Tenn.

SPECTROSCOPE for quick chemical analysis \$2.50. T. A. Cutting, Campbell 3, Cal.

COIN COLLECTING

25 DIFFERENT Indian cents \$1.50. 20 different foreign coins from 15 different countries \$1.00. 50 different from 50 different countries \$5.00. Lists—Approvals. Del Monte, 725 W. 172, New York 32.

FREE! Foreign coin, banknote and Coin Collectors' Illustrated Catalog to approval service applicants. Send 3c postage. Tatham Coinco., Springfield-D50, Mass.

COMMEMORATIVE 1/2-Columbus, Texas, Cleveland, Stone Mountain, \$1.50 ea. Illustrated Catalogue 25c. Norman Shultz, Salt Lake 9, Utah.

20 DIFFERENT Coins \$1.00. 20 different Bills \$1.00. 20 different coins and bills \$1.00. Oddehon, Box 482, St. Louis, Mo.

10 INDIAN Head cents, different dates also pricelist, 40c. Schultz, 1053 1/2 Richmond, Cincinnati, Ohio.

WORLD Coins, Large, Itemized, Descriptive List, 10c. Harry Elsholz, Box 9014B, Pittsburgh 24, Pa.

RARE U. S. 1913 B.I.P. Mint Mark \$5 Gold Coin. Make offer. Dan, 3933 D. St., Detroit 16, Mich.

CONSULTING ENGINEERS

EXPERIMENTAL Engineer. Machines. Tools designed. Technical drawings prepared for inventors. Emde, P.O. Box 391, Greenville, Tenn.

EXPERIMENTAL Engineer. Machines. Tools designed and developed. 25 years experience. Harry Childs, Berwick, Maine.

DETECTIVES

DETECTIVE Training—Secret Investigations Easy Method—Finger Prints. Booklet Free. International Detective System, 1701-P Monroe St. N.E., Washington 18, D. C.

DETECTIVES—Work home—Travel. Experience unnecessary. Write, Wagoner P-125 West 86th, N. Y., N. Y.

DETECTIVE Training, Phillips Secret Service, 1917-C North Kenneth, Chicago 39, Illinois.

FINGERPRINT Powder: new and superior powder. William Groll, Box 502, Norristown, Penna.

DOGS, BIRDS, PETS, RABBITS

ANGORA Rabbits—Wool brings \$10.00 pound! Book, "Angora Care-Management" tells everything. \$1.00. Self-cleaning scientific hutch (for all rabbits), plans, specifications \$1.00. Automatic Feeder plans \$1.00. All three \$2.50. Catalog Pedigreed Angoras free. Grinsteads, Dept. 16-A, Edwardsville, Ill.

RAISE Giant Chinchilla Rabbits. Valuable Fur. Delicious Meat. Easily Raised. Pleasant Pastime. Large Profit. Free Booklet shows amazing profits from small investment. Willow Farm, R16C, Sellersville, Penna.

A LIVING with Rabbits and Cavies. Markets Waiting. Magazine 10c. Book describing twenty breeds and magazine 25c. Book and magazine (monthly) one year 50c. Address Small Stock, Dept. 5, Pearl River, N. Y.

RABBITS—Point Free Meat—Raise delicious domestic rabbits. Small space needed. Ready market. Largest magazine in the industry tells you how. \$1 per year. Send dime for sample. No stamps. Small Stock Magazine, Lamoni 4, Iowa.

GUINEA Pigs. Easily raised. Pleasant Pastime. Big demand. Small investment. Large profits. Booklet free. Taylors Cavy Farm, Hapeville, Ga.

RAISE Moneymaking Angora Rabbits. Wool \$10.00 pound. Plenty markets. Particulars free. White's Rabbitry, Marion, O.

RABBITS: Flemish Giants, New Zealand. Reasonably priced. Franklin Young, Riverhead, Long Island, New York.

ST. BERNARD Pups: Champion sired beauties. Franklin Young, R. 3, Riverhead, Long Island, New York.

STANDARD Rabbit Journal, Milton, Pa. 3 years \$1.00. Sample dime.

RAISE Pigeons profitable business. Booklet Dime. Gebhardt Farm, Muscatine, Iowa.

DRAFTING INSTRUMENTS

SAVE on drafting materials. Free catalog. Draftsmen's Supply Co., 32 North Wells, Chicago 6.

EDUCATIONAL & INSTRUCTION

GOOD Jobs and a Sound Postwar Future await you in hotel and institutional field. Men and women—all ages—needed for well-paid positions that offer color, excitement, ever-new and fascinating duties. Record-breaking business in hotels, clubs, institutions, means even greater opportunities. Lewis School receiving calls for managers, assistant managers, stewards, hostesses, purchasing agents, and 55 other types of important positions. These are not temporary jobs, but important positions in an essential business that offers splendid opportunities in war or peace, good times or bad. Previous experience proved unnecessary! No need to leave your job to qualify. A good grade school education, plus Lewis Training qualifies you at home, in spare time. Our National Placement Bureau helps to place you—and our amazing Certified Job Plan—actually guarantees you will "make good" when placed. Write today for free book! Lewis Hotel Training School, Room DP-2768, Washington 7, D. C. (First and only School of its kind—Now in its 29th year.)

WHY Don't You Write? Writing short stories, articles, etc., will enable you to earn extra money. In your spare time we teach you to write the way newspaper men learn—by writing. Free "Writing Aptitude Test" tells whether you possess the fundamental qualities essential to successful writing. Write today! Newspaper Institute of America, Suite 366-L, One Park Ave., New York 16, N. Y.

PSYCHOLOGY teaches about mind. Biology teaches about body. Bio-Psychology teaches about powers of mind over body. Use powers subconscious mind. Select proper vocation. Grow. Broaden education. Develop personality. Control emotions. Succeed. Correspondence. Dept. P, Taylor School of Bio-Psychology, Chattanooga 1, Tennessee.

AUTO Body and Fender work, including metal work, welding and spray painting. Look into it! One of the most profitable branches of tremendous Auto industry offering chances for good job or your own business. Train in spare time. Write for Free facts. Utilities Inst., Dept. 34X, 1316 W. Belden Ave., Chicago.

TYPEWRITER Repairmen urgently needed. Earn \$40 to \$50 weekly spare time. Our easy to learn home study course teaches how to repair typewriters. Write for free information. Houston Typewriter Repair Service, P.O. Box 5357B, Houston 12, Texas.

BECOME A Doctor. Learn Chiropractic. Fast Growing Profession. Exceptional Opportunity for free course to World War 2 Veterans. No Correspondence Course. Free Catalog. Texas Chiropractic College, San Pedro Park, San Antonio 1, Texas.

CLINICAL Laboratory Technicians in great demand. We train you in your spare time, in your own home. You can practice while studying. Write for free catalogue. Imperial Technical Institute, Box 973-B, Austin 5, Texas.

GOOD "Used" self-instruction educational books on all subjects bought, sold, rented, exchanged. Satisfaction guaranteed. Complete information and 92-page illustrated bargain catalog Free. Write. Nelson Company, Dept. 2-01, Chicago 4.

FOR an extremely profitable lifetime business, operate a collection agency-credit bureau. Easily learned. Free folder. Cole Associates, Syracuse, N. Y.

BECOME a Doctor of Psychology or Metaphysics. Teach secret of contentment, happiness. Win degree of PsD. or MsD. Solve mental worries. Free book. College of Universal Truth, 5153-A N. Clark, Chicago.

BE a Doctor. Learn Chiropractic. Fast Growing Profession. No Correspondence Course. Write for Catalog. Texas Chiropractic College, San Pedro Park, San Antonio, Texas.

LEADERSHIP paves the way to Success. Enables you to rise above the crowd, influence people, master difficulties, etc. Wonderful course. Investigate. Institute of Leadership, Box 1594-C, Cleveland, Ohio.

LET me tell you how to develop your opportunities, get a better job, get better pay and win promotion. Tested methods. Free details. Machado, Consultant, 339-A E. 111th St., Los Angeles 3, Calif.

ARITHMOMETER Calculator Table that no School Child Shall be without it—send \$1.00 Cash or by P.O. Money Order to F. J. Miller, P.O. Box 266, Winona, Minnesota.

USED Correspondence Courses, Educational and Technical Books Bought, Sold, Rented, Satisfaction Guaranteed, Catalog Free. Educational Exchange, Henagar, Ala.

MAKE Up To \$25-\$35 Week as a Trained Practical Nurse! Learn Quickly at home. Booklet free. Chicago School of Nursing, Dept. K-6, Chicago.

LEARN Profitable Credit-Collection Agency Business; Investigate Educational Extension Service Advertisement under Business Opportunities.

AMAZE others. Add columns instantly. Add faster than adding machine. Free details. Maths Institute, Box 633, Mobile 4, Alabama.

PLASTIC Engineering pays big. Home study course. Low cost. Easy terms. Free booklet. Ohio Institute of Technology, Box P-254, Greenville, Ohio.

MUSICIANS, Schools, Salesmen. Make and print your own cuts without aid of press. Rush dime for booklet. Howard School of Music, St. Johnsbury, Vt.

FANCY Ice Cream Decorating course, easy condensed lessons \$1.00. E. Cook, 2745 N. 48th St., Lincoln, Nebraska.

FRENCH Introductory, 328 pages, profusely illustrated, hard cover, and Dictionary, both \$2.00. Berger, 1472 Broadway, N.Y. 18.

HOME Study Course, drugless therapy. Free literature. Institute of Drugless Therapy, Tama, Iowa.

FDR in prophecy. Dime. "Pre-Dix-It" Monthly. Free copy. Nichols, Box 85, Waltham 54, Mass.

LOCKSMITH Course. Lock-picking, key-fitting, etc. \$1.00 prepaid. Miller's Key Shop, Canadian, Texas.

MIND asleep? I'll speed it up. Dr. Tibolt, 48A, Phila. 20.

ELECTRICAL SUPPLIES & EQUIP.

AVAILABLE without priority! Fluorescent double twenty watt fixtures. Just plug-in 110 Volts alternating current, 25" long. Equals 125 Watts incandescent. Workshop reflector type, \$9.95. Kitchen model, 4" Holder, \$8.95. Complete. Fully guaranteed. Immediate delivery. Rush dollar bill with order, balance collect on delivery, plus postage. Established 1940. Naturalite, 1520 Ardmore, Chicago 26.

BROKEN—Burned out Electrical Heating elements quickly repaired. Use new amazing Nichrome Paste, simply overlap ends and turn on current. Family size \$1.00 bill. Satisfaction guaranteed. Armstrong Mfg., Box 861-Y, Minneapolis, Minn.

NOW—Repair your own electrical appliances with Chanite Self-welding, Electrical Heating, Element Flux, Instructions, delivered, price \$1.00. Chanite Sales Company, 914 South Main, Fort Worth, Texas.

ELECTRICAL appliance repairing—Genil Weld instantly welds iron, toaster and heater elements. Generous sample 10c. Money-back guarantee. Raymond Dow, 17 Park Row (1217AG) New York 7.

REPLACEMENT Elements for toasters, irons, Hotplates etc. 600w coiled element 40c. 600w flat nichrome ribbon 50c. coin or money order. Write of special element needed. Allstate, Box 434, Worcester, Mass.

DE-MAGNETIZE screwdrivers and small tools instantly. Simply attach sturdy device to AC plug. Lasts lifetime. \$1.00 Postpaid. P. S. Hall, 253 W. 55th St., New York 19, N.Y.

ELECTRIC Pencil: Writes—Engraves all Metals. \$1.00 postpaid. Beyer Mfg., 4515-C Cottage Grove, Chicago 15.

ALNICO magnet bargains. Specifications free. Eyrich, Box 849, Milwaukee, Wis.

ENGINES & MOTORS

MOTORS, small 6 volt DC reversible 3000 RPM 2" diameter, short shaft extension, suitable for operating models and gadgets Postpaid \$1.25. Walther, 235 Erie, Milwaukee.

DUPLEX Motors, Burlington, Iowa. The Universal Motor. Built for water, oil, air, steam. Pressures. 250 lbs. or less. A limited number at \$5.00. Cash Prepaid!

MODEL Engines. Castings, Supplies, Catalogue 25c. Fluxless Welding Rod Sample 25c. Howarco, P3-2417 N. Ashland, Chicago 14.

WINDING Data, listing 225 motors, single and three phase, \$1.00. Motor Data, Box 7631, Kansas City 3, Mo.

FARM MACHINERY

NEW Invention! Converts old cars into 4 wheel drive tractors, simplest, cheapest method. Pulls 2 plows in high. Lightning Tractor, Minneapolis.

FARMS, OTHER REAL ESTATE

GOOD Farms—Ranches, Washington, Minnesota, Montana, Idaho, Oregon, North Dakota. Dependable crops, favorable climate. Write for literature, lists describing typical farms. Specify which state. J. W. Haw, 120 Northern Pacific Ry., St. Paul, Minn.

STROUT'S Farm Catalog—Bigger than ever! 132 pages—1,263 bargains in 25 states from Maine to Florida, west to California & Oregon. Rock-bottom prices. Free. Strout Realty, 255-ZB 4th Ave., New York 10, N.Y.

OZARK Lands for all purposes. Actual River frontages. 5 acres \$75.00 and upwards. Free list and literature. Hubbard, 424P Minnesota Ave., Kansas City 4, Kansas.

WISCONSIN, Minnesota Lake River Frontages \$7.00 acre. 3505-C S. Hope St., Los Angeles, Calif.

OZARK farms, ranches, timber, resorts. List free. Farmfinder, Lonsdale, Arkansas.

FIELD GLASSES, TELESCOPES, ETC.

LENSES, prisms, optical specialties. Not Salvage, Not rejects. Not Junk. Highest optical perfection. Nothing like this ever offered before. Fraction original cost. Send for new optical catalog. 10 cents. Ross, 66 W. B'Way N. Y. C.

ASTRONOMICAL telescopes, Microscopes, Cameras, Binoculars, Books: Bought, sold, repaired; Lists 10c; Specify instrument wanted. Rasmussen and Reece, 41 Market, Amsterdam, N. Y.

LENSES—Prisms—Telescope Mirrors—Telescope objectives; Send for free list; Mayflor Prod., Katonah, N. Y.

GOOD 10 power telescopes \$1.90. United Camera Co., 2309-H Lawrence, Toledo, Ohio.

REAL 17 power telescopes \$3. United 2309-E Lawrence, Toledo, Ohio.

FOR INVENTORS

INVENTORS: Learn now—without obligation—how to protect and sell your invention. Write for free "Record of Invention" form and complete instructions for making disclosure and establishing date of your invention. We also send our new free "Patent Guide for the Inventor", containing complete information about patent procedure and how to sell inventions; giving illustrations of many successful inventions; over 150 basic mechanical movements. We assure you prompt, confidential service. Delays may be dangerous. Write today for your free "Patent Guide" and "Record of Invention" form. Clarence A. O'Brien & Harvey Jacobson, Registered Patent Attorneys, 52A-G Adams Building, Washington, D. C.

INVENTORS: New military and commercial inventions urgently needed by manufacturers. Write for particulars. Chartered Institute, Dept. 3-A, Washington, D. C.

WHAT Should You Invent? Our Free Book tells you what today's inventive market wants—how to put down, patent, and sell your ideas. Scores of letters in our files attest to the modern demand for inventions—our long experience as Registered Patent Attorneys will help you. Get our Free Book, "How to Protect, Finance and Sell Your Invention". Also special document free, "Invention Record" on which to sketch and describe your invention. Write today. No obligation. McMorro & Berman, Patent Attorneys, 143-P, Atlantic Building, Washington 4, D. C.

RANDOLPH & Beavers, Registered Patent Attorneys, 340-E Columbian Building, Washington, D. C. In order to protect your invention and reap the reward that should be yours, Patent your invention without Delay, and at the same time have Rights to sell as Manufacturers convert to Civilian Production. Write for Information and Record Form To-day.

INVENTORS Take Notice. Have your invention analyzed for its potential money making possibilities. I have helped others, let me help you. Strictly confidential. Technical Service, Donald Christison, Patent Analyst, 106 22 97th St., Ozone Park 16, N. Y. C.

HELP: In Selling Ideas. "Invention Market List" Shows You Where. Lists 115 manufacturers buying patented; unpatented inventions. Send \$2.00 today. Charles Francis, Invention Market Research, 342-PS Madison Ave., New York.

WE locate buyers meritorious patented, unpatented inventions. If will sell, reply immediately. Descriptive booklet, references, free. Invention Reporter, 3A-11106 S. Fairfield, Chicago.

INVENTORS! Have you good patentable ideas? Write Mr. Metzler, 11 West 42nd, New York.

PITFALLS for Inventors. Book \$1.50. Inventors Hobby Club, Box 827, St. Louis 1, Mo.

CASH for practical ideas and inventions. Mr. Ball, BB-9441 Pleasant, Chicago.

FORMULAS, PLANS, ETC.

10,000 FORMULAS, Recipes, Trade Secrets for making numerous products. Over 900 pages chock full of money-making ideas. Business opportunities galore! Shows how to make articles of all kinds. Edited by expert chemists. Illustrated. Authentic. Easy to read and understand. Start your own manufacturing business. Extra! 50 One-Ingredient Formulas. All fast selling products. Simple to make. Big sales. Large profits. Label copies. Sources of supply. Real money-makers. \$2.95 postpaid. C.O.D. U.S.A. only. Foreign \$3.50 U.S. Funds. Order today! Grand Supply Co., 2506S-52nd, Kenosha, Wisconsin.

RELIABLE Formulary. 924 page illustrated book. 10000 scientific formulas, recipes, secrets, instructions for most any product. Countless profitable business opportunities, including D.D.T., new insecticide that eliminates flies, mosquitoes, moths, lice, fleas, roaches, "bbs" etc. \$2.98 postpaid (c.o.d. U.S. only). Foreign \$3.25 delivered. Adams Brown Co., Dept. 457, Chestnut Hill 67, Massachusetts.

PREWAR Tire carcasses everywhere, from these reclaim pure rubber, to make molds, tire-plastic, etc. Details for stamp. Betke, Box 699, Borger, Texas.

FORMULAS—All kinds. Latest money-makers; literature Free. KemiKal, Park Ridge, Ill.

ICELESS Ice, Cooler, Cleaner, Cheaper. Instructions 25c. Duffy, C-28, Covington, Ky.

FRUITS AND FOODS

PEANUTS—Buy direct, roast them yourself. 10 pounds \$2.75; 50 pounds \$10.00; 100 pounds \$16.50. J. P. Council Co., Franklin, Virginia.

WHEAT Germ Unexcelled quality 2½ lbs. \$1.00 postpaid. Health-Wheat Co., Rochester 8, N. Y.

FUR FARMING

GIANT Chinchilla Rabbits. Valuable Fur. Delicious Meat. Easily Raised. Pleasant Pastime. Tremendous Demand. Small Investment. Large Profit. Willow Farm, R16, Sellersville, Pennsylvania.

MONEY Raising Rabbits. Investigate. Folder 10c. Close's Rabbitry, Tiffin, Ohio.

GARDENING

VICTORY Gardeners. Read leading books on home gardening. Write for free cut-price catalogue. Dunbar, New Brunswick 19, N. J.

HOBBIES, COLLECTIONS

MAKE any bird, Life size, shape, colors. Costs dime. No molds, special equipment needed. Pictures, Plans, Instructions, \$1.00. Birds, Box 1575, Medford, Oregon.

COLLECT Foreign Military Insignias and War Prisoners Emblems; Prices, Samples 15c. Hobbyguild F-35 West 32nd St., New York.

RADIO control—the hobby of tomorrow. Send 25 cents for Instruction Manual to Radio Control Headquarters, Box 214, Deal, New Jersey. No stamps.

EXCHANGE Matchcovers, Stamps Etc. Selected Lists, Swappers, 25c (Coin) Hobbies, Box 212, Ft. Wayne, Ind.

COLLECT colorful army patches. Latest picture book and catalogue only 15c. Insignia Mart, 703 Broadway, N. Y.

JEWELRY stones removed from rings, etc., 100 assorted \$2.40; 50 large ones \$2.40. Lowe's, Box 311, St. Louis 1, Mo.

SPECIAL Offer! Large assortment real stage money (Phoney-Mazuma) only 25c. Maniss Photo Co., Colorado City, Texas.

EXCHANGE duplicates, Swappers everywhere. List free. Box 2166-S, Denver 1, Colorado.

HOME CRAFTSMEN

PLEXIGLAS and Lucite—The amazing crystal-clear plastics. Saw, drill, bend or twist them into hundreds articles that are beautifully different! Special one-pound assortment including cement, project drawings, complete instructions—only \$1.25. Six pounds \$5.00; 25 pounds \$18.75. Masked sheets 12" x 12" (144 square inches!) ¼" \$2.50; 3/16" \$2.75; ¼" \$3.00. Fast-acting cement \$1.00. Red, blue, yellow dyes \$1.00 each. Send no money! Pay postman cost and charges on delivery. Satisfaction guaranteed. Carmon-Bronson, 165A E. Third St., Mount Vernon, N. Y.

PLASTICS and Plywood Kit. The most sensational kit ever offered to craftsmen! Contains one pound assorted Plexiglas; Bakelite; 10 square feet assorted waterproof aircraft plywood; 6 Floating Art Colors; plastic cement; red, blue, yellow plastic dyes; Franklin glue; working drawings; complete instructions. Send no money. Pay postman only \$5.00 and charges on arrival. Satisfaction guaranteed! Carmon-Bronson, 165A E. Third St., Mount Vernon, N. Y.

PLASTICS—Plexiglas, Lucite, Bakelite, Lumarith, Ethocel in sheets, rods, tubes and strips. Fine assortment of standard sizes. Cements, dyes and other plastics supplies, too! Complete lists 10c. Carmon-Bronson, 165A East Third St., Mount Vernon, N. Y.

PLYWOOD—Beautiful nonpriority aircraft, cabinet and paneling stock. Thicknesses 1/16" through 1"; large, small panels. Fir, Gum, Birch, Mahogany, Walnut. Reasonable! Complete lists 10c. Carmon-Bronson, 165A East Third Street, Mount Vernon, N. Y.

ACTION Toy. Ingenious. Different. Runs 4 minutes under its own power. Blueprints \$1.00. Build this amazing toy and other unusual Alta action toys from scrap material. Ready sale for all you can make. List free. Alta Products Co., Pasadena 20, Calif.

28 LAWN Ornament patterns 25c. Other patterns: 15"-20" high; Dutch girl, Dutch boy, pirate, bull terrier, Mexican girl, Mexican boy, dwarf, penguin, flower girl, 10c each; 3 for 25c. 25 novelty patterns 30c. All 62 full size patterns \$1.00 postpaid. Strother, Box 383-HK, Bellington, W. Va.

BUILD your own 20" Bandsaw. Equivalent in performance to \$150 machine. Non-priority materials. Large working drawings ½ scale show every detail. Price \$2.95. Bulletin and Specifications free. Alta Products Co., Pasadena 20, Calif.

35 TOY patterns \$1.00. Circus wagons, trucks, ambulance, tank, tractor, locomotive, carts, pull toys, etc. Continental products. 907 Birch, Eau Claire, Wisconsin.

MAKE Shell Jewelry. Material furnished. Tell-U-How with orders. List free. Dixie Shell Service, Sebring, Fla.

WHITTLES—20 patterns, instructions, X-Acto knife, wood. \$1.00. "Old Whittler", 1402 Charles, La Crosse, Wis.

JIGSAWING, Carving, Designing courses \$1.00. Foss, 652 Dixwell, New Haven 11, Conn.

BRASS wood screws ½" #2, 29c per gross. Gramon, 918 E. 48½, Austin, Texas.

INFORMATION

DRUNKENNESS Is a disease which responds to treatment. Medical skill plus human sympathy prove successful with liquor and drug cases. 60 years experience. Write for free booklet. P. S. Nelson, The Keeley Institute, Dwight, Ill.

INVENTIONS WANTED

INVENTORS: Have you a sound, practical invention for sale, patented or unpatented? If so, write Chartered Institute of American Inventors, Dept. 3-C, Washington, D. C.

MANUFACTURER desires postwar products to make and sell through drug, hardware, department stores and mail order. Or will handle sales only. Reputable, nationally-known organization capable of promoting nationwide sales as well as manufacture of items. Prefer non-electrical products of metal, glass, plastics, etc. Write, Box AM6, care Popular Science Monthly.

WANTED—Patented, unpatented inventions having profit possibilities, all kinds. If will sell, reply immediately. Descriptive booklet, references, free. Invention Reporter, 3B-11106 S. Fairfield, Chicago.

WILL manufacture and merchandise practical invention on royalty. Prefer mechanical device in Automotive or Appliance field. Murphy, 510 Boulevard Bldg., Detroit 2, Mich.

CASH for Inventions—Patented, unpatented. Mr. Ball, BC-9441 Pleasant, Chicago.

INVENTIONS Promoted, Patented or Unpatented. Write Adam Fisher Company, 183-A Enright, St. Louis, Mo.

INVENTORS! Have you good patentable idea? Write Mr. Metzler, 11 West 42nd, New York.

WANTED: Practical Inventions. Inventors Exchange, 336-D3 Palace Bldg., Hartford 3, Conn.

TO manufacture small devices. Mail 25c with sample. Box 209, Streator, Ill.

JEWELRY

GENUINE Diamonds, out-of-pawn low prices, wonderful values. Unredeemed loans and big buying power enable us to offer beautiful gems at prices far less than original cost. Shipped Free for Inspection. Appraisal. Send for Big Free list showing fine diamonds at startling low prices. Lloyd J. Butler, Pres., Prudential Loan Association, 133-TQ N. Clark St., Chicago 2.

CERAMIC Jewelry Supplies, Bar Pins, ear screws, for ceramic and woodworkers, also, glass and sea shell assemblers. Free catalog. Philadelphia Badge Co., 1007 Filbert St., Philadelphia, Pa.

LEGAL DIRECTORY

MEXICAN Law Practice, A. B. Flota, Box 240, Juarez, Mexico.

MACHINERY, TOOLS & SUPPLIES

GEARS—for Inventors, Experimenters, Model Makers, Schools, Work Shops, Laboratories, etc. Government surplus made of Brass, Bronze, Dural Steel and Stainless Steel. 12 Matched Pairs—24 Gears—Bevel, Internal, Spur & Ratchet. List Price \$12.00. Our Price \$2.50. 25 Matched Pairs—50 Gears, includes larger gears also sets of Worm Gears. List Price \$30.00. Our Price \$5.00. 50 Matched Pairs—100 Gears, better assortment, also Crown, Helical and Worm Sets. List Price \$75.00. Our Price \$10.00 Limited Quantity—Order Now. Note—These gears are sold in sets only as listed above. Met Exchange, Dept. S, 323 Canal St., New York.

PLAN your postwar workshop now around Lewis Mills, Shapers, Drill Presses and other metal and woodworking tools—and save up to 80% of usual cost by completing them yourself. Plain or semi-finished castings furnished with all materials and construction blueprints. Send 10c to cover cost of mailing catalog describing 23 items. Lewis Machine Tool Co., P.O. Box 116, Station A, Dept. S-54, Los Angeles 31, Calif.

DANDY 8 Piece Set: Cheetee Pliers, Water-pump Pliers, Masterratchet Pipe Wrench, Needle-nose Pliers, Crescent Wrench, Diagonal Cutters, Claw or Pein Hammer, Plastic Screwdriver, \$14.85. Universal Tool Co., 1527 Grand PSM, Kansas City, Mo.

DRILL GRINDER—Grinds drills to factory accuracy. Calipers with direct reading scales. Circle cutters. New Tool grinder. Lowest prices. Free literature. Factory. 811-A East 31st, Kansas City 3, Mo.

BALL Bearings—all standard makes. Can supply from large stock promptly. Save 50 to 60%. Fully guaranteed. Write for Bulletin S, Met Exchange, Dept. S, 323 Canal St., New York.

400 VALUABLE New Springs, 75 kinds, numerous sizes, 10,000 uses. \$2.00. Larger, complete assortments, \$3.00, \$5.00. Technico, Box 246, W. Hartford, Conn.

MAGIC TRICKS, PUZZLES, JOKER NOVELTIES

500 TRICKS you can do! Douglas' famous Catalog of 500 Tricks, now only 10 cents. America's fastest service on magic for pocket, parlor, stage, professional, amateur. Douglas' Magicland, Dallas, Texas.

84 CARD Tricks and our latest catalog of Magic Tricks only 25c. Ball Square Company, Dept. 11-E, 697 Broadway, Somerville 44, Mass.

MAGIC vanishing card. Throw it into air, it completely disappears, reproduce it later from spectators pocket. Easy to do. Complete 25c with magic catalog. The Magician, 2463-D Kensington Ave., Philadelphia 25, Pa.

MAGIC Is Fun! Send \$2.00 for apparatus to perform 10 different, startling tricks. Guaranteed \$5.00 value! Free, with your order, book of "102 Tricks". Robbins Co., 152-S West 42nd St., New York.

MAGICIANS' Gamblers' secrets exposed. Cards, Dice, Punchboards, Slot Machine. Catalog 10c. Book Co., Box 671, St. Louis 1, Mo.

ATTRACTIVE Magic kit of 10 tricks (\$2.50 value) \$1.00 postpaid. Latest catalogue included. Kogel's Magic Novelty Co., 6751-B Colbert St., New Orleans 19, La.

FLOATING Cigarette. Trick—Cigarette floats in mid-air—with instructions, ten cents. J. Eastwood, Box 623, Parkersburg, W. Va.

MAGIC Package 25c, 55 easy tricks \$1.00. Lindhorst Magic Den, 612-P.C. Pine, St. Louis, Mo.

TRICKS, Secrets, cards, punchboards, etc. explained. Big illustrated circular free. Mack, Box 1278-P, San Francisco.

VANISHING Quarter and Catalog 25c. Sterling Magic, 347 John R., Detroit, Michigan.

MANUFACTURING

2000 OR more Metal Stampings manufactured as low as 2½c each. Send sample or sketch to Precision Pressed Products, Box 898, Glendale, California.

MODELS of Inventions, Dies, tools, etc., Danco, 3933 D St., Detroit 16, Mich.

MILITARY INSIGNIA

SILK Embroidered Emblems. Sample and price lists 10c. New Insignia Guide 10c. Insignia made to order. Hobbyguild, X35 West 32nd St., New York.

FOREIGN Insignia Packet, and booklet, \$1.00. Insigniacraft, 236 28th Ave., N.W., Calgary, Canada.

FOREIGN decoration ribbons, insignia, lists, sample 20c. Insigniacraft, 236-28 Ave., N.W., Calgary, Canada.

MILK GOATS

FREE: Postcard request brings you book about dairy goats and sample monthly magazine. (Subscription \$1 yearly). Dairy Goat Journal, Dept. 568, Columbia, Mo.

MINERALS & PRECIOUS STONES

GEMS, precious and semi-precious, all genuine, from world wide sources. Deal direct, no overhead, save money. Catalog 10c. Hill Co., Route 7-K, Salem, Oregon.

"GARNETS" from Arizona Deserts. Packet for Quarter. Mineral Specimens, Box 2651, Phoenix, Arizona.

FOUR pieces colorful Agate \$1. Rockhound, Box 555, Grand Junction, Colo.

MISCELLANEOUS

AMAZE your Friends. Make big money! Tell unspoken questions. Give names, addresses and other personal data of perfect strangers immediately! Easy to learn. No assistant. Completely illustrated professional mind reading course—Only \$1.00. The Archer Co., Dept. 9B-93 Federal St., Boston 10, Mass.

TAILORED Homes plan-book. Sixty floor plans one-story houses with choice of new, smart exteriors styled Colonial, English, Spanish. Moderne making hundreds of combinations. Price \$1.00! Select homes showing two-story houses in colors, \$1.50. Prepare for rationing-plan now! H. P. Jones, Architect, 486-P.S. Brandeis Bldg., Omaha 2, Nebr.

FREE Yourself from disease, sickness, fear, and poverty by removing the mark of the beast. Copy-righted 42,000 word booklet reveals the name, mark, and image of Beast No. 666. Tells how to overcome it, thus eliminating these negative conditions. \$1.00 Postpaid. Cedric P. Moore, 1313 S. Union St., Kokomo, Indiana.

SPECIAL—Men's Wristwatch straps, genuine leather, \$2.00 value all widths. Black or Tan, 79c each postpaid. All Leather combination Wallet and pass case, Tan or Black, \$1.00 each postpaid, forward Money Order. Leather Specialties, 1840 Gladstone St., Phila. 45, Pa.

GOOD "Used" self-instruction educational books on all subjects bought, sold, rented, exchanged. Satisfaction guaranteed. Complete information and 92-page illustrated bargain catalog Free. Write—Nelson Company, Dept. 2-01-2, Chicago 4.

DRUNKENNESS Is a disease which responds to treatment. Medical skill plus human sympathy prove successful with liquor and drug cases. 60 years experience. Write for free booklet. P. S. Nelson, The Keeley Institute, Dwight, Ill.

BOY Scouts—Campers, U. S. Army Surplus Used Equipment, Pup Tents \$2.95. Canteens, with cover and cup \$1. Mess Kits 75c. Packs \$1. Complete set \$5, includes cartridge belt. Samet Sales Co., High Point, N. C.

MEDICAL Laboratory Technicians in great demand. We train you in your spare time, in your own home. You can practice while studying. Write for free catalogue. Imperial Technical Institute, Box 973-S, Austin 5, Texas.

I GET 4 to 35 shaves from each double edge razor blade of any brand. Send 25c and learn how I do it without extra cost. Dawson Service, 3929½ Middlebury St., Los Angeles 4, Calif.

BUYING, Selling, Trading—Messages listed Free. Stamp please!—New! Real "Zipper-Attached" envelopes! Samples, details 10c. Bankewitz, Virginia, Hempstead 8, N. Y.

MEXICAN—Aztec featherwork tropical bird picture cards, samples 25c, bulletin free. Mexican Products Co., 126 N. Main, Tulsa 3, Okla.

MEXICAN Jumping Beans, Dozen 25c. Hundred \$1.00, Thousand \$5.00. Mexican Products Co., 126 N. Main, Tulsa 3, Oklahoma.

GREAT Fun. Pretend visiting N. Y. Souvenir, Cards 25c. Photo-Cards Assortment 50c. Catalog, Samples 10c. Haller, 436 N. Y. Ave., Brooklyn 25, N. Y.

RECEIVE Mails, Moneymaking Opportunities, samples, literature. Your name in several mailing lists, 10c. Rodgowski, 3415 Broadway, New York 31.

BOOKFINDERS! (Scarce, out-of-print, Curious books) Supplied promptly. Send wants. Clifton, Box 1377psm, Beverly Hills, Calif.

NEW toys in wood or steel wanted. Let us be your distributor or manufacturer. Send samples to City Machine Co., 868 E. Tallmadge Ave., Akron, Ohio.

SALESBOARDS Jackpot, Premium, and Candy Boards. Lowest Prices. Write for circular, state what business you're in. Dept. F, Box 563, Hays, Kansas.

ARMY Engineer sighting level all Metal-Brand New—\$1.50 each. Public Sport Shops, 13 S. 16th St., Phila. 2, Pa.

RUBBERIZED typewriter or adding machine covers \$1, postpaid. Hastings Typewriter, Hastings, Nebraska.

FINANCIAL Education, get what you want now! Write today. Todd's Service, 30 W. Madison, Youngstown 2, Ohio.

CIGARETTE Roller machines, metal \$1.00 each postpaid. 342 N. 16th St., Phoenix, Arizona.

MAKE your own Plastoplate printing cuts. Simple, easy, economical.—Adayservice, Argyle, Wisconsin.

OPEN, Test, Locks,—5 Pass Keys \$1.00. National Service, 322-J Union Ave., Brooklyn 11, N.Y.

GIANT explosive "caps". Easily made. Instructions 50c. Fixit Shop, Dublin, Texas.

UNIQUE Novelties. Samples 10c. Modern, Box 2-M, Station B, New York 2.

UNPAINTED Wall Plaques 2½c up. Write, Soman, 642 Broadway, St. Paul 1, Minn.

FIFTY Magic Races for \$1.00. S.K.S., 11404 Superior, Cleveland 6, Ohio.

SQUARE Dance instructions, calls, 25 sets, \$1.00. Ozarkiana, Lonsdale, Arkansas.

MODELS & MODEL SUPPLIES

SHIP model kits and fittings. Complete line Fisher model yacht equipment. All Boucher, Fisher, Marine Model and Ideal Kits, fittings and blueprints at standard prices. Most complete stock in New England. Send 10c for price lists. James Bliss & Co., Inc., 220 State St., Boston, Mass.

BUILD The famous P.T. Boat. Most authentic model kit on market. 130 precision parts, ready to assemble. No tools needed. Descriptive folder free. Creative Crafts, Box 236-B, Winnetka, Illinois.

ILLUSTRATED Catalog over 100 models. Castings and Blue Prints. Steam and Gasoline Engines. Locomotives, 10c postpaid. Active Products & Supply Co., 53 W. Jackson, Chicago 4.

SCALE Railroaders: Polk's 128 page, profusely illustrated "H.O." catalog; Equipment, accessories, fittings, etc. Exciting quiz game feature. 25c refundable with order. Polk's, 314 5th Ave., New York 1.

POLK'S complete "Solid" model airplane catalog. 60 pages! Hundreds of illustrations, descriptions, specifications! Building data! 15c (coin or stamps). Polk's, 314 5th Ave., New York 1.

WORLD'S Largest Selection Model Engine Castings and Drawings. Illustrated Catalogue 10c. Miller, No. 908C, 6th Ave., Belle Plaine, Iowa.

MOST complete Illustrated Catalog—"O-HO OO" Model Railroad Parts ever published. Send 5c for mailing. Selly, 1377 Gates Ave., Dept. 819, Brooklyn, N. Y.

RAILWAY Models complete line, informative catalog HO and O Gauge 79 pages 25c. Walther, 269 Erie, Milwaukee, Wisconsin.

RADIO control for your model. Send 25 cents for Instruction Manual to Radio Control Headquarters, Box 214, Deal, New Jersey. No stamps.

BOAT Models. P. T., Cabin Cruiser, Speedboat. Free Circular. All Star, 2003 Lincoln Ave., Chicago 14.

MONEY MAKING OPPORTUNITIES

BE A Novelty Manufacturer. Start in any community, large profitable orders waiting, no experience or expensive equipment needed. Dollar sack of material oftentimes makes \$50.00 worth of finished merchandise. Opportunity for permanent post war business. Plastex Products, 127 Clement St., San Francisco 18, California.

MECHANICALLY Inclined Men—Own and operate general Appliance Repair shop. Complete, illustrated course shows you how. Welding, Refrigeration, Motor repair. How to get business, etc., all phases covered. Free literature. Christy Supply, Dept. 1453, 2835 N. Central Ave., Chicago.

ELECTRIC Clocks are every where you go, buildings, homes, parking-lots, factories. Repairs increasing. Our easy to learn course with pictures and drawings teach you how to repair these clocks. Electronic Supply Co., Box 2350-B, Houston 1, Texas.

INDEPENDENCE, Increased earnings, no money worries. Forget Postwar Layoffs. "Help Yourself to Postwar Prosperity" shows how. Details Free. National Business Bureau, Dept. A7, Box 5374, Chicago 7, Ill.

LEARN Metascience. Remarkable drugless healing. No manipulation. No apparatus. Unbelievable simplicity and results. Inexpensive correspondence course. Write Metascience, De Land, Florida.

A \$100-A-MONTH hobby at home! No soliciting, no mail order, no meeting people. Easy, enjoyable pastime. Details. 25c (Refundable.) Laura Dickson, 808A Elizabeth St., Anderson, S. C.

MEN-Women—be independent, start own business at home. Literature, describing over 100 tested "Money-Making Plans" 10c. Foucher & Son, 17218 Detroit St., Detroit 24, Mich.

\$100 A WEEK. In Your Spare Time, running your own business from Home or Bedroom. Guaranteed Legitimate Plan \$1.00. Richard Clark, Box 33, Geraldton, Ontario.

GIANT big mail! Hundreds of money making propositions, home work offers, including big magazine, all for a dime. Gardenville Publishers, Gardenville 12, N. Y.

SELL office supplies by mail. Samples, moneymaking information for 25c, refundable. Edgar W. Thomas, Barnesville 11, Ohio.

WHOLESALE catalog, and directory 10c. (Refundable) over 1,500,000 articles. Stafford, Sunnyside-X, Indianapolis 44, Ind.

EARN money at home! Thousands do! "Home Worker Magazine" tells how. Sample, 25c. Sizemore, Box 6, 4917 North Kostner, Chicago.

"VARIOUS Opportunity Catalog". Copy 10c. P. O. Box 1735, San Diego 12, California.

DETECTIVES Earn Big Money. Experience unnecessary. Particulars free. Wagoner, P-125 West 86th, N. Y., N. Y.

FREE Literature Describing Hundreds moneymaking Home business opportunities. Tipton, 433 Tacoma, Ottumwa, Iowa.

FREE Literature explaining Profitable Mail-Order homework. Cutler Publishers, Reading, Penna.

EARN money evenings, copying and duplicating comic cartoons for advertisers. Comic-Ads, Argyle, Wisconsin.

MONEY Making Opportunities—Literature Free. Gerald McNeely, 3044 Jackson Blvd., Chicago 12, Ill.

WANT financial independence? I've helped thousands. Dr. Tibolt, 47A, Phila. 20.

MAKE extra money at home. Details free. Lumco, Kimball, Nebr.

MONUMENTS

WRITE For Direct Prices \$14.00 Up. Freight Paid. Guaranteed. Free Catalog. Granite-Marble Factory, A49, Oneco, Fla.

MOTION PICTURE & SOUND EQUIPMENT

KODACHROME travel, glamour movies. Descriptive catalog, 25c. Beautiful projection length "Waikiki Hula" sample film, \$1.00. Specify 8mm, 16mm. Iriscope kits, \$5.00. World in Color Productions, Box 392-A, Elmira, N. Y.

BETTERPIX outdoor safety film, 100' 16mm. \$2.50, 25' double 8mm. \$1.25. Free Developing. Finished subjects sold. Exchanged. Sound Library. Better Films 742 New Lots, Brooklyn 7, N. Y.

UNUSUAL Home Movies—Travel, Comedy, Adventure, sports, news war film, many film bargains. Big 1945 catalog and sample, dime. Audet, Box 6520-AG, Philadelphia 38, Pa.

FEATURE sound programs—shipped anywhere \$4.95 complete. Free Catalog. National Cinema Service, 71 Dey St., New York.

8-16mm SILENT-sound films. Complete rental library. All latest subjects. Free catalogue, (sample film 10c). Garden Film, 317 W. 50th, New York 19.

RENT—Buy—Exchange 8/16mm; silent, sound. New money-saving plans. Free details. Midland Film Exchange, Box 429, Oak Park 3, Ill.

35 MILLIMETER Sound films for sale. Stamps for lists. Mertz Films, Springfield, Illinois.

LEARN Movie Projection, Management. Free catalog. Give age. Theatre School, Elmira, N. Y.

MOVIE Projectors bought and sold. List 10c. United 2309-D Lawrence, Toledo 6, Ohio.

GLAMOUR Girls. Sample. Dime. Zientek, 1129 Monroe Circle, Baltimore 25, Maryland.

SALE-Rent 8-16mm Films. Catalogues 10c. Don Elder's, 739-B Boylston, Boston 16, Mass.

I BUY—Swap—Rent—Sell 8mm, 16mm movie films. Harvey Iris, Box 539, Brockton, Mass.

BEAUTIFUL Kodachrome Slide and list, 25c. Art Slide Co., S-1, Canton, Ohio.

FRESH Movie Camera Films. Ambassador, 479-A Quincy St., Brooklyn, N. Y.

SEND stamp for 16mm, 8mm catalogue. Sterling's, 679 Northampton, Easton, Pa.

MOTORCYCLES, BICYCLES & SUPPLIES

CLYMER'S Motorcycling Manual. Illustrated, complete information, specifications, descriptions, dozens motorcycles. Engines, transmissions, carburetors, cams, spring frames, hydraulic forks, sidecars, expert riding instructions. Contains two-cycle and power bicycle information. Postpaid \$2.00. English Motorcycle Service Manual. Most popular English makes, technically described, illustrations, mechanical features. Postpaid \$1.50. America's most complete catalog Motor Books 10c. Clymer, 2125 W. Pico, Los Angeles 6, Calif.

TIRES, Tubes, Wheels, for industrial trucks, carts, wheelbarrows, scooters, midget cars, coaster wagons. Nationally known makes, first-line quality. Sizes 8" to 18" o.d. in 2, 4, and 6 ply tires, separate inner tubes, heavy duty demountable wheels. Also Caster Forks, straight and swivel types. Free illustrated circular and prices. Jahant Co., 626 E. Exchange St., Akron 6, Ohio.

"MODERN Motorcycle Mechanics," manual, enlarged, revised second edition. 550 pages, 300 illustrations. The most up-to-date and complete motorcycle book published. Covers operation and servicing Harley-Davidson, Indian and British makes. Available immediately. Price \$3.00. Nicholson Brothers, Motorcycle Engineers, Saskatoon, Canada.

CLYMER'S Motor Scrapbook. Hundreds early motorcycles, automobiles illustrated, described. Amusing, fascinating story of Floyd Clymer's experiences in motor business. Time Magazine called it a "must." No. 1 and No. 2 entirely different, each \$1.50. DeLuxe cloth bound edition, each \$2.50. Clymer, 2125 W. Pico, Los Angeles 6, Calif.

MOTORSCOOTERS \$50 up; motorbikes \$40 up; motorcycles \$35 up; motors \$5 up. Tires, parts, plans. Mailorder only. Send 25c for Big War-Bargain catalogue Number Eight, listing hundreds of bargains in motorscooters, motorcycles, midget cars, etc. (35c by first class mail). Midget Motors Directory, Athens, Ohio.

PROFESSIONAL Midget Racer, Motor-scooter, Midget Car and Midget Motorcycle. Plans and specifications for all these contained in new illustrated handbook, 25c. Big list used motors, motorscooters, Servicycles, etc. included free! Midwest, 2242 Beaufort, Toledo, Ohio.

WHEELS, Tires, and Tubes for Motor Scooters, Midget Cars, Wheelbarrows, and other Industrial equipment. All sizes. Also Bicycle Parts and accessories. Largest stock in United States. Send dime for list. Cycle Transport Company, 1241 S. Michigan Ave., Dept. C, Chicago 5, Illinois.

BOOK "Speed—How to Obtain It." Illustrated, instructions, cams, balance, timing, valves, pistons, racing technique. World's greatest speed tuning book. \$1.50 postpaid. Clymer, 2125 W. Pico, Los Angeles 6, Calif.

MOTORBIKE and motor manual, including Motor-bike Scooter plans, Catalog section and motor tune up information \$1.00. Variety Enterprise, Post Office Box 124, Evansville, Ind.

MOTOR Books. Most complete automobile, motorcycle selection in America. Historical, technical, racing. Send dime for book catalog. Clymer, 2125 W. Pico, Los Angeles 6, Calif.

PLANS? Scale drawings, specifications, illustrations for building attractive Motor Scooter complete \$2.00; plans electrically driven bicycle \$1.50 postpaid. Clymer, 2125 W. Pico, Los Angeles 6, Calif.

BUILD America's lowest priced motor-scooter speedster! Complete plans, specifications, \$1.00. Big list used motors, etc., included free! Motor Supply, Box 1682-CS, Toledo, Ohio.

MOTORCYCLE Muffler, Steel Packed, beautiful tone, seamless streamline design, \$6.00. Really beauties. Sandee Muffler Co., 7523 S. Western Ave., Los Angeles 44, Calif.

BUILD Midget Racer from castoff parts! Plans, Specifications, construction information \$1.00. Motor Supply, Box 1682-CS, Toledo, Ohio.

BOYS! All bicycle repair secrets revealed. "Bicycle Repair Manual" 65c. R. G. Klausner, Shelbyville, Ill.

PARTS accessories pistons chain Harley Davidson Motorcycles. McCann's, P.O. Box 114, El Paso, Texas.

MUSIC, MUSICAL INSTRUMENTS

PLAY Professional Piano Right Away. New patented Play-At-Once sheet music at your music counter or send \$1.00 for 3 complete pieces. Agents-Dealers wanted. Money-back guarantee. Keyboard Music Co., 840PS N. Michigan Ave., Chicago 11, Ill.

OLD Band Instrument made like new again by Selmer master craftsmen. All makes, all instruments, expertly reconditioned. Local music dealer can forward instrument or write for price list. Dept. B, Selmer, Elkhart, Indiana.

PIANISTS—Quickly improve technique, sightreading, accuracy, memorizing, playing through Mental-Muscular Coordination. Free Booklet. Broadwell Studios, Dept. 95H, Covina, California.

SONG Poems Wanted, for musical settings. Send poems for Free Examination. Write for Free Instructive Booklet outlining Opportunities. United Music Corporation, Salem 12, Indiana.

PLAY Swing Piano! Send 10c for instruction bulletin. Christensen Studios, 765 Kimball Hall, Chicago 4, Ill.

SING high, sing low with ease, revolutionary method mailed for 1 Dollar. Oluf L. Veien, 809 Bradley Pl., Chicago 13, Ill.

OLD STAMPS WANTED

WHAT have you to offer? A collection? A "Shoe Box" accumulation? Anything in stamps. We urgently need them. Spot cash paid. Cosmopolitan Stamp Co., 1457 Broadway (Times Square), New York.

PATENT ATTORNEYS

WHAT Should You Invent? Our Free Book tells you what today's inventive market wants—how to put down, patent, and sell your ideas. Scores of letters in our files attest to the modern demand for inventions—our long experience as Registered Patent Attorneys will help you. Get our Free Book, "How to Protect, Finance and Sell Your Invention." Also special document free. "Invention Record" on which to sketch and describe your invention. Write today. No obligation. McMorro & Berman, Patent Attorneys, 143-R, Atlantic Building, Washington 4, D. C.

INVENTORS: Learn now—without obligation—how to protect and sell your invention. Write for free "Record of Invention" form and complete instructions for making disclosure and establishing date of your invention. We also send our new free "Patent Guide for the Inventor," containing complete information about patent procedure and how to sell inventions; giving illustrations of many successful inventions; over 150 basic mechanical movements. We assure you prompt, confidential service. Delays may be dangerous. Write today for your free "Patent Guide" and "Record of Invention" form. Clarence A. O'Brien & Harvey Jacobson, Registered Patent Attorneys, 52B-G Adams Building, Washington, D. C.

PATENTS Secured. Two valuable booklets, "Patent Protection" and "When and How to Sell an Invention", together with valuable "Evidence of Invention" form sent free. Write immediately to experienced patent counselors, Victor J. Evans & Co., 941-H Merline Bldg., Washington, D. C.

INVENTORS: Before disclosing your invention to anyone send for Form "Evidence of Conception"; "Schedule of Government and Attorney's Fees" and instructions. Sent free. Lancaster, Allwine & Rommel, Registered Patent Attorney, 413 Bowen Building, Washington 5, D. C.

PATENTS—Trade marks. Preliminary advice, book and disclosure form free. Personal service. Irving L. McCathran, 316 McLachlen Bldg., Washington 1, D. C. Registered Patent Attorney.

"INVENTOR'S GUIDE" free, containing 100 mechanical movements, information about patenting, selling inventions. Frank B. Ledermann, 154 Nassau St., New York 7.

C. A. Snow & Co., S-427 Snow Bldg., Washington 1, D. C. Registered Patent Attorneys. Established 1875. Literature mailed on request.

PATENT Protection. Write for information. Fees. Record of Invention. Free. Randolph & Beavers, 340-A Columbian Bldg., Washington, D. C.

PATENTS Obtained; selling service. information, recording forms free. Labiner, World Building, New York 7.

PERSONAL

GAVITT'S Herb Tablets. You perhaps have tried vitamins and chemical drugs for Constipation and its Effects. Why not return to old time successful methods during Grandmother's days, of using natures intended, all vegetable or botanical ingredients? Gavitt's Herb Tablets is an old time herbal family medicine, an Aid to nature, used over 50 years, millions of tablets sold. Guarantee in each \$1.00 box. Caution, use only as directed. Special, for your first test, send this advertisement and \$1.00 currency for regular \$1.00 box, and we will send Extra \$1.00 box to give to a friend. Gavitt Medical Co., Gavitt Bldg., Dept. 46, Topeka, Kansas.

BE Lonely No More! Open Destiny's Door! 50c Brings Cupid's Destiny. World's Greatest Social Publication, including nationwide names, addresses; either sex. Captivating descriptions; sparkling pictures—widows, widowers, bachelors, beautiful girls desiring early marriage. (Year, bi-monthly, \$1.00.) Mention your age. Destiny League, Aberdeen 75, Wash.

MEET New Friends through our Personal Service dedicated to promotion of interesting friendships. Discriminating clientele, all religious faiths. Established 1935. When in New York visit us, Grace Bowes, American Service 236-PS W. 70th St., New York City, N. Y.

DRUNKENNESS is a disease which responds to treatment. Medical skill plus human sympathy prove successful with liquor and drug cases. 60 years experience. Write for free booklet. P. S. Nelson, The Keeley Institute, Dwight, Ill.

PSORIASIS Sufferers: Pixacol has brought relief when everything else failed. Use only as directed. Apply externally, dries quickly, convenient. Try regular \$1 bottle without investing a cent! Write: Pixacol Lab., Box 3583, Cleveland, Ohio.

BUSINESS, Personal, and Mechanical Problems or often more satisfactorily solved through the objective viewpoint. Advice on any problem, \$1.00. Analyst, 621 N. Second St., Rockford, Ill.

LONELY? Join Exclusive Club, correspond with ladies, gentlemen seeking friendship and marriage. Write Lee Miller, P.O. Box 67, Times Square Station, New York City.

GET Acquainted Club—Through social correspondence thousands yearly meet their "ideal". Write for list of eligibles. Many in your State. Simpson, Box 1251, Denver, Colorado.

WIDOW and Widowers Club. (Confidential details 25c.) Write John Rankin, Springfield, Missouri.

CHINESE Physicians Secrets. 165 pages, rare illustrations, unpublished truth, secret arts, peculiar customs, \$1.00. Garding Lui, Box 6227, Metro Station, Los Angeles, Calif.

WEAR regular suspenders underneath shirt. Makes shirt and trousers have neater appearance, feel more comfortable. Complete instructions 4 dimes. Rico, Dept. D, Box 82, Alexandria, Va.

LONELY? Plain sealed details free. Largest Club in West. Endorsed by ministers. Club Elite, Box 71, Los Angeles 53.

MAKE new friends thru old reliable club. Free book with photos of members. Correspondence confidential. Exchange Company, 3827-PS Main, Kansas City, Mo.

ATHLETE'S FOOT remedy Guaranteed. Medically recommended \$1.00 bottle postpaid. Dr. W. J. Renz, D.S.C. Room 3, Chavanne Bldg., Lake Charles, Louisiana.

SEE your name in newspaper headlines. Startle your friends. Fun Galore. Free Details. Write—Horne, Box 372M, Back Bay Annex, Boston 17, Mass.

MOVIE Stars latest loveable, beautiful. Actual Photographs 20 for \$1.00. Guaranteed Samples 25c. O. N. Meyers, Box 246, Glendale, California.

LONESOME? Write to Broadway Friendship Club. P. O. Box No. 67, Times Square Station, New York City for correspondence, friends, marriage.

MODERN foot remedy. Relieves athletes foot, itching and burning feet. Satisfaction guaranteed. \$1. Pendant Co., Box 50-PA, Times Square, New York City.

PIN-UP Dream Girls, adults only, 15 unusual real candid photographs, 3½ x 5 \$1.00, 6 for 50c. Hirsch, 119 W. 33rd St., Dept. K, New York 1, N.Y.

"BUYING Bloomers." lusty spicy hot, talkie comedy story. \$1.00 Postpaid. "Little Eve," P.O. Box 211, Terre Haute, Indiana.

LEARN Ventriloquism. 3c stamp brings particulars. Smith, Dept. 222, 801 Bigelow, Peoria, Illinois.

NERVOUS? Bashful? Fears? Free. encouraging information. John Englund, Ironwood, Michigan.

LOSING Hair? Instruction. How to easily retain hair for life. Send 25c to, I. Fantiola, 1863 Barnes Ave., Bronx, N. Y. C.

BEAUTIFUL Girls. Bathing beauties. Attractive poses. 10 for 50c. United Arts, 2309-G Lawrence, Toledo, Ohio.

CHANGING jobs post-war? Find what you're best fitted for. Free information. Vocations, Box 86, Highland Park, N. J.

SEEKING New Adventures—Read Pen-Pal Journal. Copy, addresses, 10c. Box 2083, Dallas, Texas.

PUZZLE friends, letters mailed from Portland, Oregon. 10c. Franklin, Box 3842, Portland 8, Oregon.

HYPNOTISM. Complete 20 Method Course, 25c. Western Institute Hypnotism D-1619, Palatine, Ill.

LONELY? Let Birds Of A Feather help you. S. Dickinson, Box 142, Bangor, Maine.

CONSTIPATION relieved without drugs by a druggist's formula. \$1.00. W. P. Lee, P. O. Box 4515, Atlanta, Ga.

LOOK Taller! New, quick system! Up to 6¼" reported! Information free! Prohaska Studio, PS-7, Johnstown, New York.

LONELY? Trailsend friend awaits you, particulars, Box 2027, Madison, Wisconsin.

YOU'LL Have penpals worldwide. Illustrated Magazine with list 10c: World Card Club, King, North Carolina.

PRETEND visiting New York: 25 cents. Fascinating details. Souvenir Free. Haller, 436 N.Y. Ave., Brooklyn 25, N.Y.

LONELY—Join Tower Club. Particulars for stamp. Francis Tower, Box 444-P, Kansas City, Mo.

GIRL photos, spicy but beautiful. \$1.00 for group. "Little Eve," P.O. Box 211, Terre Haute, Indiana.

LIVE Longer, feel better, enjoy life. Free information. Fairchild Co., Mt. Vernon, Ohio.

FOOT Sufferers fibre metal Arch Supports Guaranteed. Send \$1.00 and shoe size. Blair, 4520 Sheridan-40, Chicago.

LONESOME? Get "Cupid's Mail". Many wealthy. (Stamp). Excel, 2149 Jackson, Chicago 12, Ill.

REJUVENATION of Men, Women. Literature \$1. Healthotel, South Whitley, Ind.

HAIR Falling? Dandruff? Write Trichologist, 139 Lewis Street, Phillipsburg, N. J.

DO You Know God Booklet, One Dime. Box 3255, Orlando, Florida.

PLASTICS

SPARKLING Colors for Lucite, Plexiglas, other plastics. Beautiful shades any color desired by dipping plastic in water solution of ingredients available drug or 10c stores. Full details two tested formulas, alternate ingredients, with complete mixing directions, \$1.00. Kenson Plastic Products, 954 S. La Brea Ave., Los Angeles 36, Calif.

"PLASTICS in a Nutshell." Complete outline. Includes instructions for starting profitable plastics fabricating business. \$1.00. Plastics Information, Box 633, Stamford, Conn.

PHOTO FINISHING

SENSATIONAL introductory offer! Send snapshot or negative, this ad, and 3c. We'll send you a beautiful 7" x 5" enlargement! Or, Kodak roll developed with 16 guaranteed deckled-edge velox fadeproof prints or 8 double-size prints, 25c! Special! From your negatives, 16 regular-size or 8 double-size reprints, 25c! Candid Rolls—36 exp. 35mm developed, vaporated, enlarged to 3x4, \$1.00! 18 exp. 50c. Reprints, 3x4, 3c each. We have new, perfect 35mm film. Low prices. Free Mailer, details on request. American Studios, Dept. 280, La-Crosse, Wis.

BIGGEST \$1.00 value in 35mm finishing today. 36 exposure fine grain 3¼x4½ enlargements; deckled, embossed margin and date. Eighteen exposure 75c; 18 exposure splits 55c; 36 exposure reloads 50c. Special: return this ad with \$2.00 and we will send five 36 exposure reloads. Free Mailers. 8 exposure rolls in beautiful, deckled contact finish with embossed wide margin, 25c. Mailbag Film Service, Box 5440A, Chicago 80.

BEAUTIFUL double size Pictures 3½c each, from 116 and 120 negatives, 3¼x4½ from all other sizes. All work guaranteed. Overnight service. Roll developed and 8 pictures 30c. Roll 12 pictures 45c. Roll 16 pictures 60c. Enlargements on double weight portrait paper 5x7—30c, 8x10—50c. Copies made from any picture 75c. Pacific Photo Service, Box 666, San Francisco, California.

YOUR 6-8 Exposure Roll Developed and Two prints each good negative 30c: Or enlarged to about Post Card size 8 Exposures 25c. 12 Exposures 40c. 16 Exposures 50c. Rapid Foto Service, G.P.O. Box 413, New York 1, N. Y.

SATISFACTION or your money back 2 regular size prints from each good negative on 8 exposure roll complete 25 cents or 8 jumbo size prints complete 30c. The Old Reliable. Pioneer Photo Company, Box 123-PS, Wichita, Kansas.

ROLL Developed and 8 beautiful enlargements 2 to 6 times larger. Deckled Edge—High Gloss. Any 8 exposure roll 25c coin, 12 ex. 35c—16 ex. 50c—36 ex. \$1.00. Reprint Enlargements 3c each. Alden Photos, 94-4 Astor Station, Boston 23, Mass.

EVERY picture an enlargement! 8 sparkling deckle-edge Enlargements and roll developed 25c coin; 116 size or smaller; enlarge reprints 3c. Enlarge Photo, Box 791Q, Boston, Mass.

AT Last! Roll Developed, all your snapshots hand-colored as beautiful as most actual colored photography 35c. Hand colored reprints 4c each—12 for 45c. National Photo Art Co., Janesville 27, Wisc.

100 MINIATURES \$1.00 1½" x ¾". Any Photo (returned) gummed perforated, for stationery, etc. Lang, 1334 Thorndale, Chicago.

POULTRY & SUPPLIES

RAISE turkeys the new way, write for free information explaining how to make up to \$3000.00 in your own backyard, address National Turkey Institute, Dept. 57, Columbus, Kansas.

PRINTING, MULTIGRAPHING, MIMEOGRAPHING, LABELS

QUALITY Printing one color 1,000 each letterheads, \$6.85. Invoices, Statements \$5.50, 6 3/4 Envelopes \$4.25, # 10 \$5.50. Remittance must accompany order. Geo. LaDreau, 1222 1/2 E. Second, Duluth 5, Minnesota.

OFFICE, Factory forms, Business, Personal Stationery printed. Send requirements. Quotation, Price List, Samples free. How Printing Co., 717-23 Eunice, Webster Groves 19, Mo.

\$2.00 POSTPAID; 150 8 1/2 x 11 Good Bond Letterheads and 150 6 3/4 Envelopes, 500 of each \$5.75 postpaid. Mero Products, Box 344, Punxsutawney, Pennsylvania.

400 5 1/2 x 8 1/2 LETTERHEADS \$1.25. Free Samples. Mango Printing Co., 555-B S. 20th, Newark 3, N. J.

FREE! Printed Gummed Labels. Send Stamp—Box 391, Charlotte 1, N. C.

PRINTING OUTFITS & SUPPLIES

PRINT your own Postal Cards, paper, or anything on "Printomatic Self-feeding Rotary Postal Card Stencil Duplicator. Only \$9.50 with \$2.35 worth of supplies, Stencils, Ink, etc. Literature Free. Pittsburgh Typewriter Supply, 336-RA Fourth Ave., Pittsburgh 22, Pa.

PRINTING equipment, type and supplies. Send stamp for details or dime for complete illustrated supply book. Kelsey Inc. X-8, Meriden, Conn.

PRESSES, Type cutters, Supplies, Bargain Bulletin 3c. (Export orders Acceptable). Levinson, Box 918, New York 8.

INEXPENSIVE home-made printing press. Details free. Novelty Shop, Downsville, Louisiana.

PRINTING Presses, Type, Supplies. Lists 3c. Turnbaugh Service, Laysville, Pa.

PRESSES, Type, Supplies, Specimens, 3c. La Garza, 8 Walden, Cambridge, Mass.

PROFITABLE OCCUPATIONS

ANNOUNCING home study course in commercial baking. Practical basic training. Good field for those with aptitude. Nearly depression proof. Send for free booklet, "Opportunities in the Baking Industry." National Baking School, 1315 Michigan Ave., Dept. 172-A, Chicago 5, Ill.

LOCKSMITHING—Profitable Business or Hobby! New course teaches you how to pick locks, fit keys, de-code, masterkey, etc. Easy self-instruction lessons. Bargain price. Free details. Write—Nelson Company, Dept. 7-01, Chicago 4.

AGENTS Sell Factory Workers Stainless Steel Pocket Rules with Pocket Clips. Sells for 75c to \$1.00. Big Profit during noon hour. Sample, 50c; dozen, \$3.60. Nothing Free. Mark Specialty, 89 Westminster Rd., Rochester 7, N. Y.

\$40.00 WEEKLY. Made growing mushrooms. Fresh, Dried, Dominion Patent 331583, free spawn, North American, 169Y Yonge, Toronto, Canada.

\$5000 FROM Half Acre! Growing Ginseng. Seed, contract supplied. Particulars 10c. Associated Growers, Dept. 12, St. Norbert, Manitoba.

HOMEWORKERS, make, sell, shell novelties. Beginners Samples, instructions. \$1.00. Temple, 224-6th Ave. S., St. Petersburg, Fla.

EXCEPTIONAL profits raising mink. Finest breeding stock available. Details furnished. Franklin Young, Riverhead, Long Island, New York.

MUSHROOMS Grown: Boxes, Barrels. Instructions 50c. Spawn \$1.00. Gordon, 553 William, Winnipeg, Manitoba.

RADIOS, SUPPLIES & INSTRUCTION

HEAD Phones:—Latest type. Light weight. Finest Quality, with plug for tuning in on radio, adaptable for use in making crystal sets. Slightly used sets, without head bands, \$1.25; With leather covered adjustable head bands, \$2.50; New sets, without head bands, \$1.75; New sets, with leather covered adjustable head bands and rubber covers, \$3.75. Add 25c for mailing, send money order. Quantity Limited. Dept. A, Nico Supply Co., 540 N. 17th St., Phila. 30, Pa.

CRYSTAL Radio operates loudspeaker, illustrated instructions 25c. Sensitive crystals 25c. Tuning coils 40c. Old Reliable crystal kit \$3.25 Radio-Phones \$4. "No Aerial" crystal circuit works on ground-wave 15c. 75 foot aerials 85c. Enamelled wire 25c per coil. "World's Simplest" one tube circuits 25c. Catalogue free. Hulet, 29 E. 39th St., New York.

YOUR New Free Catalog is Ready! Radionic's Catalog No. 26 lists hard-to-get radio parts. All available for immediate shipment. Send today to: Radionic Equipment Co., Dept. 5C, 170 Nassau St., New York 7, N. Y.

REPAIR Minor Radio troubles even though inexperienced. Sections on car, home Radios. Repair Radios for others mail 25c for booklet to, Radio, Box 311-B, Benton Harbor, Michigan.

RADIO Service men and experimenters send for our giant radio catalogue. Save dollars. United Radio Co., (1000-V), Newark, N. J.

MAKE Simple, tubeless, batteryless, distance-getting crystal radios, crystal and illustrated instructions, 25c postpaid. Allen, S-427, Clinton, Missouri.

REVISED Plans 18 Crystal Sets (SW record 5300 miles), including Radiobuilder, 25c. Laboratories, 2610-T 18th Ave., San Francisco 16, Calif.

BUILD radio complete with tubes \$10.95, details. Radio, 9418c Ave. A, Brooklyn, N. Y.

BUILD Latest, Extra-Loud Crystal Set. Instructions, Data, 20c. Amorose, Rt. 4, Hungary Road, Richmond, Va.

LOWEST Prices. Radio Tubes, parts. Bargain lists 3c. Potter, 1314 McGee, Kansas City 6, Missouri.

FAMOUS Razor Blade Radio! Illustrated Plans 35c. New Radio, Lohrville, Iowa.

RAZOR BLADES

NEW Discovery Mysto Magic Razor Blade Sharpener and 25 Guaranteed Blades \$1.00 Postpaid. Roy, 3060 N. 29th, Kansas City 2, Kansas.

100 DOUBLE-EDGE blue surgical steel razor blades \$1.50 prepaid. Fully guaranteed. St. Moritz Blade Co., 321 Broadway, Dept. BA, New York 7.

REMINGTON shaving powderstick 92c includes postage and Federal Tax. Humphrey's, 240 Claiborne Pl., Long Beach 7, Calif.

RUBBER STAMPS

YOUR name and address on a three line, cushioned indexed rubber stamp with knob handle sent postpaid for \$1.00. Cash with order. Write. Ideal Rubber Stamp Co., Detroit 8, Mich.

SELF-INKING Pocket Stamps—2 lines \$1.00; 3 lines \$1.25; Dater 50c. Postpaid. Circular free. Press, Warm Springs 1, Georgia.

SONGWRITERS

POEMS Wanted. To be set to music. Send your song poem today for free examination by our staff headed by nationally famous hit composer of "Dream A Little Dream of Me". Our new 6 step plan is most liberal and complete ever offered. Write today for free booklet. Screenland Recorders, Dept. PS, Hollywood 28, Calif.

SONGWRITERS: Collaborate with nationally famous composer of "Boots and Saddles". Send poems for free examination. Get Free instructive booklet. Hollywood Harmony House, 126 S. La Brea, Studio I-5, Los Angeles, California.

"THE Complete Songwriter". A new home study course of instruction—words, music and arrangement. Simple, practical. 96 page book. \$2.00 postpaid. M.O. Puritan Publishing Co., Dept. APS, 343 S. Dearborn St., Chicago 4, Ill.

SONG writers: Melodies supplied without charge by recognized Hollywood composers. Lead sheets and records furnished. Cinema Song Company, Box B-25, Beverly Hills, California.

NEW songs and lyrics wanted for popular radio program and professional promotion. Free examination. Transradio Music Inc., Department P.S., 1650 Broadway, New York (affiliate of B.M.I.)

POEMS Wanted to be set to music. Free examination. Send poems. McNeil, Master of Music, 510-PS S. Alexandria, Los Angeles, California.

SONGWRITERS—Send Poem For Immediate Examination and Free Rhyming Dictionary. Richard Brothers, 46 Woods Building, Chicago.

SONGWRITERS: Send Poems for Free Examination. Write for Free Instructive Booklet Outlining Opportunities. United Music Corporation, Salem 18, Indiana.

POEMS Wanted for Musical Setting. Send poem for immediate consideration. Five Star Music Masters, 646 Beacon Building, Boston.

SONGWRITERS—Send Poems for immediate examination and Free Book, "Your Future in Songwriting". Radio City Music Academy, 1674 Broadway, New York 19.

SONGWRITERS—Get the facts first. Write today for free booklet "Getting Ahead in Songwriting." Song Service, 331-J W. 46th, New York.

BUY original melody outright. No strings. Its all yours, \$10. Piano part. "Tune-smith", 1959 77th St., Bklyn, N. Y.

SONGWRITERS: Royalty Contract Free. Write for details. Puritan Publishing Co., 343 S. Dearborn St., Chicago 4, Illinois.

SONGWRITERS! Amazing, outstanding offer. Hibbeler, C15, 2157 N. Avers, Chicago.

OUTSTANDING Songwriting Service, Barnhart, 1320 48th, Des Moines 11, Iowa.

SPORTING GOODS, GUNS, FISHING TACKLE, ARCHERY

LIFE Belts & Rubber Boats—(Dual Life Preserver Belts) (Seconds). Ideal for Sportsmen. Uses Sparklet Cartridges or inflate by mouth. Without Cartridges, new, \$4.95. Used \$1.95. Mae West Life Vests, used, repairable, with repair kit \$2.95. New \$14.95. Collapsible rubber boats. Write for circular. Karl Ort, Dept. PS-2, York, Pa.

WANTED—Any make, size, age or condition, outboard motors, fishing tackle, hip boots, waders, binoculars, guns, ammunition, tents traps or any other outdoor sports equipment. No foolin, write your own price. Outdoor Directory, Box 707, Marion, Indiana.

BOWS—Arrows for Recreation—Hunting—Fishing. Beautiful Archery instruction book, 70 pages, 50 illustrations, only 50c. Illustrated catalogue Free. Archery Sales-Service, 617 South State, Chicago.

USED Guns, Binoculars, bought, traded, sold. Ammunition bought. Highest Cash Prices Paid. Stoeger Arms Corp., 507 Fifth Ave., New York, N. Y.

GUN Bluing Salts Pistol, Size \$2.95. Shotgun \$4.95. Custom Bluing-Plating guaranteed. GunBlu, 2700-S Fig. Tampa 6, Fla.

1945 ILLUSTRATED Firearms catalog for collectors and shooters. Price 50c. House of Guns, Alpine Place, Arlington, N. J.

WHITTAKER'S—20 patterns, instructions, X-Acto knife, wood. \$1.00. "Old Whittler", 1402 Charles, La Crosse, Wis.

THOUSAND Bargains, firearms, binoculars, war relics, catalog 30c. Smith Museum, Runnemede, N. J.

INDIAN Fishing—Trapping Secrets, book 50c. Chief Blackbird, 679-PS Dupont North, Minneapolis, Minn.

SEND 10c for list 100 used guns. Frayseths, Wilmar, Minnesota.

USED guns, bought, sold, exchanged. List stamp. Howe, Coopers Mills, Maine.

STAMP COLLECTING

SPECIAL Album Free—The United States Flag Series for twelve overrun Nations is the most unique, remarkable, impressive, and beautiful set of stamps ever issued. It fairly cries for a special album worthy of it, such as we have published. It's a very fine album of 34 pages. Cover designed by a famous artist. Arrangement artistic and practical, telling the history of each honored nation.—It is Free to sincere approval applicants. Just send 10c for mailing expenses, and state whether you desire approvals of the United States or foreign stamps or both. Approval Headquarters, Globus Stamp Co., 268 Fourth Ave., New York City 10, Dept. 217.

ZOWIE-E-E! A Barrel of Fun for only a Dime! 500 United States—Absolutely unpicked and unsorted—just as received from church missions. Many varieties, including large commemoratives airmails, high denominations up to \$5.00! Stampdom's biggest package of fun—and you might find something really valuable!! Price only 10c to serious approval service applicants. Money back if not delighted. Illustrated bargain lists with each order. Mystic Stamp Company, Department 55, Camden, New York.

LOOK! 500 mixed, absolutely unsorted, unpicked, Canadian stamps—only 10c to serious approval applicants! Postage paid both ways! Included may be some real finds, rare old as well as late issues, commemoratives, airmails! Compare, and you'll realize what a remarkable offer this is. Send for it today! Special rates to stamp club members. Melvin Okin, 915-SS Bryant Ave., New York 59, N. Y.

WOW! \$10.00 Worth of Fun—Only 10c!
500 foreign stamps, unsorted and un-picked, just as received from church missions, other sources. Africa, So. America, Australia, China, Philippines, Dutch Indies, and other countries. Includes few commemorative, airmails, and stamps cataloging up to 25c or more each! Biggest value in stampdom—and you might find something really valuable! Price only 10c to serious approval applicants! Money back if not delighted. Jamestown Stamp Co., Dept. 5, Jamestown, New York.

DESIRABLE New Falkland Island Depend-ency Stamp. MacArthur stamp from Australia, Abyssinian Wild Elephant issue, plus host of others from New Caledonia, Indo-China, Russia, Cuba, Wallis & Futuna, Dutch Indies, China, Philippines, etc., only 5c to approval applicants. Big Dime Packet List free! Methuen Stamp Service, Inc., Dept. 46, Lawrence, Mass.

FREE! The Stamp Finder! Send today for big new edition, fully illustrated, enabling you instantly to identify all difficult stamps! Also fine packet strange, fascinating stamps from Bosnia-Herzegovina, Monaco, Patiala, Cyprus, etc., including maps, ships, animals and strange scenes. All free to approval applicants inclosing 3c postage. Garcelon Stamp Co., Box 918, Calais, Maine.

POSITIVELY Greatest Free Offer—Latest Scott's International \$5.00 Stamp Album—covering entire World, contains 36,000 illustrated, descriptive spaces; Scott's 1945 Standard \$5.00 Catalogues "Philately's Encyclopedia"—absolutely Free to applicants for Foreign Approvals becoming customers. Bargain Stamp Service, Palm Springs, California.

EXOTIC Pictorial Collection: Tahiti Spear-fishing, Melanesian Idol—Carib Archer—Columbo Harbor—Reunion Produce—Jugoslavia—Philippines—Porto Rico—Malagasy Farmer—Dutch Indies—South Africa—Roman's Charity—Martinique Settlement—Newfoundland Codfish—Djibouti Locomotive—Victoria. Everything only 5c. Imperial Stamp Co., Yonkers 1, N. Y.

FREE! Leeward Is., Cayman Is., Turks and Caicos plus 60 different mint Geo. VI Coronation poster stamps, to approval service applicants sending 3c postage. Tatham Stampco., Springfield 50, Mass.

VICTORY Packet Free! Includes stamps from Tanganyika—British Cayman Islands—Animal—Scarce Babyhead—Coronation—Early Victorian—Airmail—Map Stamps—with Big Catalogue—all free—send 5c for postage. Gray Stamp Company, Dept. PR, Toronto, Canada.

WORLD'S Largest Diamond And Triangle Stamps. Free Stamp Magazine, Stamps from Fighting Free French, 20 stamps from 20 different Countries, Pictorials, Airmails, Big Bargain 5c with approvals. Capital Stamps, Dept. 10, Little Rock, Ark.

SMOKY Mountain commemorative sheet, largest U. S. stamp issued, and 33 U. S. including commemoratives, airmail revenues, etc. Catalogs 75c—To approval applicants for 5c. Curhan Stamp Company, Dept. C, Gloucester, Mass.

UNITED STATES Collection. Fifty different mint commemoratives, very fine, un-hinged condition from 1920—1939. Price \$2.00 with request for United States Approvals. Fort Orange Stamps, Albany 7, New York.

SPECIAL—Airmails—19 different, including Zeppelin, Triangles, Latin America, etc. 5c with approvals. Continental Stamp Co., Box 606, Dept. C, New Rochelle, New York.

118 DIFFERENT stamps including commemoratives, charities, airmail, sets, etc. Only 3c to approval buyers. We buy collections. Badger Stamp Co., Milwaukee 3, Wisconsin.

SCARCE 1880 U. S.—Hussey Local Carrier Stamp listed at 15c. Also Costa Rica No. 65 listed at 40c. Both sent free to approval buyers sending 3c postage. Pladon Stamps, 1717-S Idaho, Toledo 5, Ohio.

FINE Approvals, freshly mounted. Fast, personal service. Tell me what countries you prefer and I'll send their stamps. Milton Skinner, 345 East Ocean, Long Beach 2, Calif.

114 DIFFERENT stamps from far away countries including Airmail and Free Fighting French to approval applicants for 10c. Reich Stamp Co., 4647 Kenmore, Chicago 40, Dept. S9.

FREE—Canadian Sets. Royal Visit, George VI, George V, Coronation, Jubilee, others, to approval applicants. Ensign, Box 118-P, So. Orange, N. J.

FREE—50 different foreign stamps with approvals. Send postcard, letter unnecessary. Universal Stampco., 1216-A Park Row Bldg., New York 7, N. Y.

UNITED STATES \$4.00, \$5.00, and \$10.00 stamps only 3c to approval applicants, sending for free packet. Wineholt Co., Woodbine 4, Pa.

FREE, 30 Different including Cossack Diamond, 1/2 stamp Triangle, Gobi, others. Approvals included. Send 3c postage. Pilgrim, Waverly-18, Baltimore, Md.

WHOLESALE! Ready built approval books. 100% Profit. Per Book—\$2.00. You'll order more. Avegno, 3225 Napoleon, New Orleans 15, La.

\$50.00 FOR 102 Lincoln Head Pennies—Album & Details 50c. 75 U. S. Postage Stamps 35c. Senga, Box 186, Milwaukee 9, Wisconsin.

BRITISH Empire! 55 Different including Batum, Burma, Cyprus, Gwalior, Tasmania, 5c to Approval Buyers. Lyman, 97 Nassau St., New York 7.

COMPLETE "United States" catalog with 1000 illustrations! Send 10c for mailing. Harris & Co., 99 Transit Bldg., Boston, Mass.

UNITED STATES approvals complete coverage fine quality, attractive prices. Seminole Stamps, Box 436, Coconut Grove, Florida.

FLASH! Amazing value! Djibouti, Kenya, Cameroons, Lebanon, Ceylon, others, all 6c. Approval applicants. Southwest Stamp Co., Box 117, Long Beach 1, Calif.

UNITED STATES and Foreign Approvals. Fine Quality, attractive prices. Archibald Stamp Co., 40 Railroad Ave., Taunton, Mass.

NEW Zealand Commerce Set—10c. Approvals. Utechts, 1143-D N. Keeler, Chicago 51.

55 DIFFERENT United States 5c with Approvals. Bookman, Box 145-P, Maplewood, N. J.

DEALER'S Wholesale Catalog. Postage 3c. Franksco, 5031 Queensberry, Baltimore, Maryland.

100 MIXED Foreign, United States illustrated catalogue 10c. Kleinman, Jenkin-town, Pa.

FREE!!! British Empire Packet. Postage 3c. Williams, 601 Archerbldg, Baycity, Mich.

FREE! Pony Express set (facsimiles). Postage 3c. Roberts, 401 Shearerbldg., Baycity, Mich.

FREE! Western Hemisphere Packet. Postage 3c. Owens, 801 Welshbldg., Baycity, Mich.

FREE! Complete Balkan aviation set with approvals. Beaman, Glenburnie 10, Maryland.

SCARCE Medellin Midget stamp free with approvals. Seminole, Glen Burnie, 10, Maryland.

JUST Out! Free New Packet and Collection List! Intercity Co., Dept. Y, Port Washington, N. Y.

QUITTING Business! \$4 catalog value all different \$1.00 postpaid. Fair Stamps, Bristow, Oklahoma.

POUND Bag unpicked stamp mixture containing thousands \$1.00. Longacre Shop, 100-C W. 42nd, New York City.

1,000 GRABBAGS, 15c each. Special Bags 25c. Sandy, 630 Bingaman, Reading, Pennsylvania.

FRESHLY mounted approvals for collectors using Scott's International Junior Album. Wlaschm, 13 Nagle Ave., New York 34.

ATTRACTIVE Approvals for Beginners, advanced collectors. Jacobsen, 59 Nagle Ave., New York 34, N. Y.

MOZAMBIQUE Triangle Air-Mail set 10c with approvals. Vargo Stamps, Racine, Wisconsin.

FREE! Stamp wallet, sincere approval buyers. Thiese, 9320 San Juan Ave., South Gate, California.

25 DIFFERENT Guatemala 10c with 1/4-1/2-1c Approvals. Carroll's, 4357 C S. Hoover, Los Angeles 37, California.

FIFTY Canadian, Newfoundland, includ-ing earlies, commemoratives 10c ap-provals. Reade, 696 Gerrard, Toronto.

ARMY-Navy set 10c, United States and Foreign approvals. Yokums, Box 1327, San Antonio 6, Texas.

TRIANGLES—(Mozambique Co.) other beauties, 10c. Approvals. Reuter, 611-D W. 40th, Los Angeles 37.

COSTA RICA diamond shape set 8c. P. Gustafson, Box 1206, New Britain, Con-necticut.

10 U.S. CIVIL War Issues 5c; Approvals; Graffam, 268 Boston, Medford 55, Mas-sachusetts.

PENNY Approvals that satisfy. Neil Gron-berg, Box 5441S, Philadelphia 43, Penn-sylvania.

1000 MIXED U. S. Old and New 25c. 2 lbs. \$1.60. Weatherby, Medina, Ohio.

LOW Price U. S. Foreign Approvals. Scott, 30 Baker Ave., Lexington, Mass.

60 DIFFERENT United States, 10c. Price-list free. Seidenberg, Cassopolis, Mich.

1000 DANDY U.S. Mixture 25c. Monjar, 1750 Fairmount, Cincinnati, Ohio.

6 MONTHS Subscription 10c! "Stamp Post", Station A, Pasadena 3, Calif.

FIFTY Stamps from fifty countries, 10c. Garrow, 851 W. 177th, New York 33.

TATTOOING SUPPLIES

TATTOO Outfits, inks, designs. Write today. Zeis Studio, 728 Leslie, Rockford, Illinois.

TOBACCO—PIPES

CIGARETTE Papers—Same as ready-made, plain or gummed, 24 leaf books 1c. Rollers 50c Postpaid. Pete Moberly, Box 786, Owensboro, Kentucky.

FIFTY Quality Cigars \$3.25, \$3.85, \$4.10, \$4.85. Continental Cigars, Corning, N. Y.

TRAPPING

ELEVEN good Box Traps. Complete blue-prints 30c. Wee-Sho-You, Box 51, De-troit, Mich.

TREES, SHRUBS, ROOTS, HERBS

FLORIDA Royal Palm seeds, ten for \$1.00. Micol, Box 532, Miami Springs, Fla.

TYPEWRITERS

TYPEWRITERS. Mimeograph, Multi-graph, Presses, Supplies, Office Appli-ances. DixieGraph Co., King, N. Car.

VOCATIONAL GUIDANCE

DISCOVER your best abilities through scientific aptitude tests. Information 10c. Testing Service, 202-S2, Commercial Bldg., Rockford, Illinois.

WATCHES

WATCH and clock repairing—complete practical course in modern horology. 66 illustrated self-instruction lessons. Just out! Low price. Information Free. Write —Nelson Company, Dept. 8-01-2, Chi-cago 4.

WATCH and clock repairing increasing, complete home study course with draw-ings and pictures. Information free. Houston Chronomatic and Watch Co., P.O. Box 5367B Houston 12, Texas.

WELDING, SOLDERING

PERFECT welding, brazing, soldering with tested, light-work "Super-Welder." Ideal for home, farm, office appliances. Begin-ners become experts quickly with this simple-to-operate outfit. Full instructions. Operates AC-DC, 110 Volts. Plugs in any-where. Complete with Metallic Arc, Flame Torch, Mask, Supplies. Guaranteed. 5 Days' Free Examination. Only \$19.95. Save 2% send check with order. Super-Welder Mfg. Co., Dept. B, 23 E. 20 St., New York 3, N. Y.

ELECTRIC welder guaranteed 6 months. Penetrates 16 gauge metal or money back. \$3.95 complete. 110 volts AC-DC. Victory welder complete, less jar, wire, \$1.95. Essay Mfg. Co. H. N. Quincy 69, Mass.

SLIGHTLY used Arc Welders. Recom-mended by R. E. A. Guaranteed. Forney Mfg. Company, Ft. Collins, Colorado.

BUILD Small, Medium or large DC or AC Arcwelder. Plans \$1.00 each. Welders Club, WB-3432, Chicago 54.

WAR

SURPLUS BARGAINS

SENSATIONAL VALUES FOR QUICK LIQUIDATION

7 LB. RADIO PARTS ASSORTMENT



A "gold mine" for the radio serviceman. Hundreds of valuable radio parts, including rivets, soldering lugs, sockets, coils, resistors, trimming condensers, etc.

A130R—7 LBS.

\$1.79



LENS and PRISM ASSORT.

For experimental work in optics. Consists of 27 precision ground and polished prisms and lens elements in assorted diameters and focal lengths. Big variety, positives, negatives, etc. Actual value over \$100.00

A519-27
PIECES **\$7.95**

TANK CORPS RADIO HEADPHONES

Extremely sensitive with 4000 ohms resistance. Brand new and fully guaranteed. With moisture-proof cord and phone plug. A splendid value for the radio serviceman and experimenter.

A106 PAIR **\$2.95**



14 INCH BOLT CLIPPERS

Heavy duty type with compound lever jaws. Used but guaranteed perfect. Ideal for farm and factory use.

A115—EACH ONLY... **\$2.95**



ARMY MESS KITS

Regulation Army mess kits. Ideal for campers, boy scouts, etc. Slightly used but guaranteed perfect.

A116—EACH ONLY **69c**



U. S. GOV'T CANTEENS

Regular U. S. Gov't. issue canteens. Plastic screw top cap chained to body. Slightly used.

A117—METAL BODY Each..... **69c**

A118—PLASTIC BODY Each..... **69c**

A119—Canteen covers, ea.... **35c**

A120—Canteen cups, ea.... **25c**

USED U. S. GOV'T PUP TENTS

Regulation army pup tents of durable brown canvas. Used, but in good condition. Fine for campers, outdoorsmen, boy scouts, etc. A grand gift for boys.



A100—TENT ONLY, EACH **\$4.95**

A101—Ropes, wooden poles and stakes for above. Per set **\$1.00**

BANDOLEERS



used but guaranteed serviceable.

A129-11 POCKET, EA. **49c**

Army Bando-leers of heavy khaki. Used by hunters, boy scouts, etc. Slightly

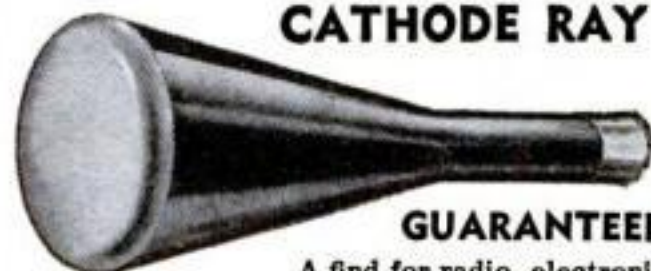
U. S. GOV'T. BOLO KNIFE



Extra heavy Bolo Knife ideal for home, farm or jungle use. Blade of government formula. Cutlery steel. Walnut riveted handle, 3 1/2 inch hilt, 10 1/2 inch blade. You'll find hundreds of uses for a Bolo Knife—makes a grand gift for a serviceman. Weight 2 pounds. A112—WITH ARMY SHEATH **\$4.95**

A212—LEATHER SHEATH, EXTRA..... **\$1.50**

CATHODE RAY TUBES



PURCHASED
FROM
U. S. GOV'T

GUARANTEED QUALITY

A find for radio, electronic and television experimenters. Slightly used by U. S. Government for test work. Each tube has been tested and is guaranteed to give excellent service. These tubes are standard Nos. 5 BP1 or 5 BP4 with 5 inch screen. Bargain list of other tubes on request. 5 INCH TYPE 5 BP1 OR TYPE 5 BP4, EACH, EXP. COLLECT..... **\$12.00**

TWO MICRO-AMP. METERS IN ONE

A super value for the radio serviceman and electronics experimenter. Actually two meters in one. First movement scaled for 100-0-100 reading; second movement with 0-200 micro-amp. range. Luminous pointers. Zero adjustment on each movement. Made by Westinghouse. Original cost \$40.00 or more. Factory calibrated scale included. Brand new.

A114—EACH, ONLY..... **\$9.85**



MILITARY SLIDE RULE



Specially designed for Army use. Measures 2 x 18 x 3/8 inches. Calibrated in yards and meters. Reversible sliding segments. Original value \$20.00. A121—EACH ONLY... **98c**

COMB. AIR PILLOW AND LIFE BELT



Of rubberized khaki 10x40 inches in size. Used as life belt, raft or air pillow. Quickly inflated or deflated. Used but guaranteed water and air tight. A127—EACH **98c**

800 Ft. 16mm FILM CANS

Film storage cans for 800 ft. 16 mm reels. Rich maroon finish. A splendid value. A-150- **49c** EACH.....

***AIR MATTRESSES—EXTRA LARGE

6-3 in. AIR
CELLS



ized material. Quickly inflated or deflated. Folds compactly. Guaranteed perfect.

A122—EACH. COMPLETE..... **\$10.59**

For campers, outdoorsmen, boy scouts, servicemen, etc. Six separate (slightly used) air chambers provide a 3 inch cushion of air. Measures

24x54 inches—fits cot or sleeping bag. Outer envelope of black, waterproof, rubberized material.

ORDER DIRECT FROM THIS AD

Values galore! Hundreds of hard-to-find items for home, shop and outdoors. Make remittances by money-order, bank draft or personal check. Send 25% deposit on C.O.D. orders. Include sufficient postage on parcel-post orders—any overage will be promptly refunded. All quotations F.O.B. Chicago. Used items and materials are guaranteed serviceable and as described. Your money back if not more than satisfied.

BIG ILLUSTRATED CATALOG FREE

STARK'S

Dept. P57
509 So. State St.
CHICAGO 5, ILL.

PLASTICS

LUCITE AND PLEXIGLASS

In sheet form. Good workable sizes. Transparent. For costume jewelry, etc. Easy to work and polish. A280—5 LB. **\$4.75**

ASST.

CATALAN—ASST. COLORS

Extruded shapes, rounds, half rounds, etc. Easy to machine. Furnished in assorted colors, shapes and lengths. A281—5 LB. **\$4.75**

ASST.....

CAVALRY SPURS

Genuine wishbone type cavalry spurs. Nickel plated brass. A102, Pair... **98c**
A103 Spur straps per set of four..... **50c**



MOSQUITO TENTS

Of marquisette with taped seams. Metal rods and bars included. Covers cot or hammock. Brand new. A104 EACH..... **\$2.95**



POST-GRADUATE PILOTS



Over the Himalayan "Hump"—Photo Chinese News Service
—Paul Guillumette

The Ferrying Division of the Air Transport Command is "big business" in military flying. It takes "post-graduate" pilots—pilots who are tops in instrument flying skill—to handle this job.

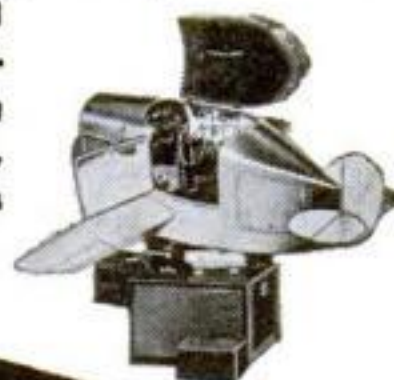
The big C-54's which cross the Atlantic in winter, link the foggy Aleutians to the mainland, or battle the elements over the Himalayan "Hump," encounter weather at its worst. And there's no turning back; their precious, urgent cargoes must go through!

For this exacting and vital air transport service are needed the best flyers in the world. That is why ATC assigns only seasoned aviators to its four engine school. And that is why they are trained to become experts in precision flying—"post-graduate" pilots on the world's toughest airline routes.

Instrument flying courses and "refreshers" in the Link Trainer are an integral part of this training program. The Air Transport Command, like the airlines, has proved that Link instruction on the ground makes for safety in the air!

SAVES LIVES, TIME, MONEY!

Millions of costly hours of flying time in training planes have been saved by instrument instruction in the Link on the ground. Millions of gallons of precious aviation fuel have been conserved for combat missions. And because of instrument flying skill, the lives of many, many of America's sons have been saved.



Link
Aviation Devices, Inc.
BINGHAMTON, NEW YORK, U. S. A.

LINK MANUFACTURING COMPANY, LTD., GANANOQUE, ONTARIO, CANADA,

**Makers of Link Trainers, Crew Navigation Trainers
and other Devices contributing to the safety of flight**



In the camp at Sagan, Major Orris and his fellow prisoners provided for their needs with homemade equipment described on the following pages. At the right is their symbolic version of AAF wings.



Yankee Ingenuity Licks Prison-Camp Hardships

By VOLTA TORREY

FOR Maj. William Orris and hundreds of other American air-
men, being captured by the Germans was like being stranded
in an incredibly weird and inadequate world. They were always
hungry. They had no tools, and scarcely any material except
tin cans. Yet they re-equipped themselves with nearly as many
things as a novelty store sells—and they pulled through.

Orris is a tall, bright-eyed pilot who parachuted into the en-
emy's custody five weeks before D-day and escaped three weeks
before VE-day. His B-24 was hit by flak in a bombing run over
Toulon. Blinded and nauseated by gasoline fumes, he went out

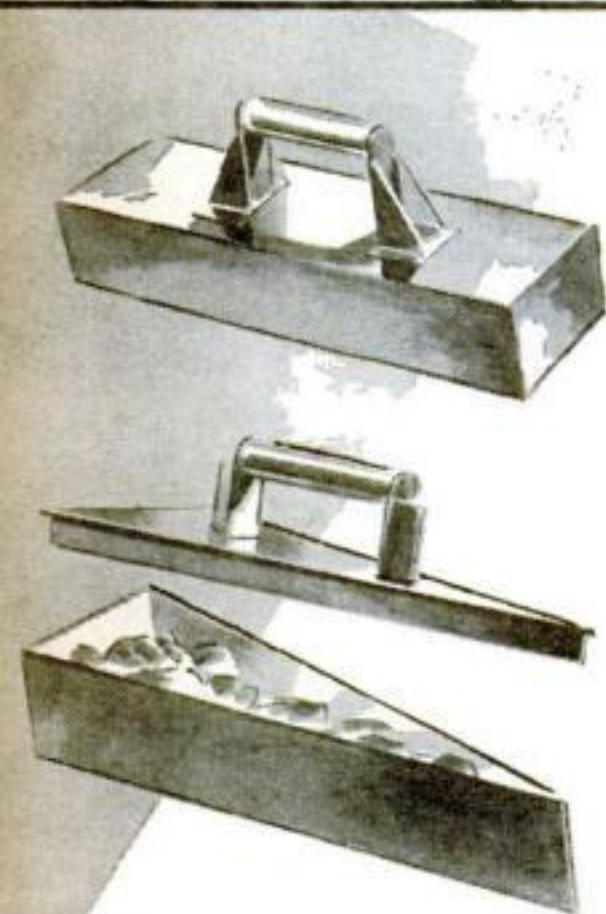


JULY, 1945

MAJ. WILLIAM ORRIS bailed out
into captivity five weeks before D-
day, was a prisoner for over 11 months.

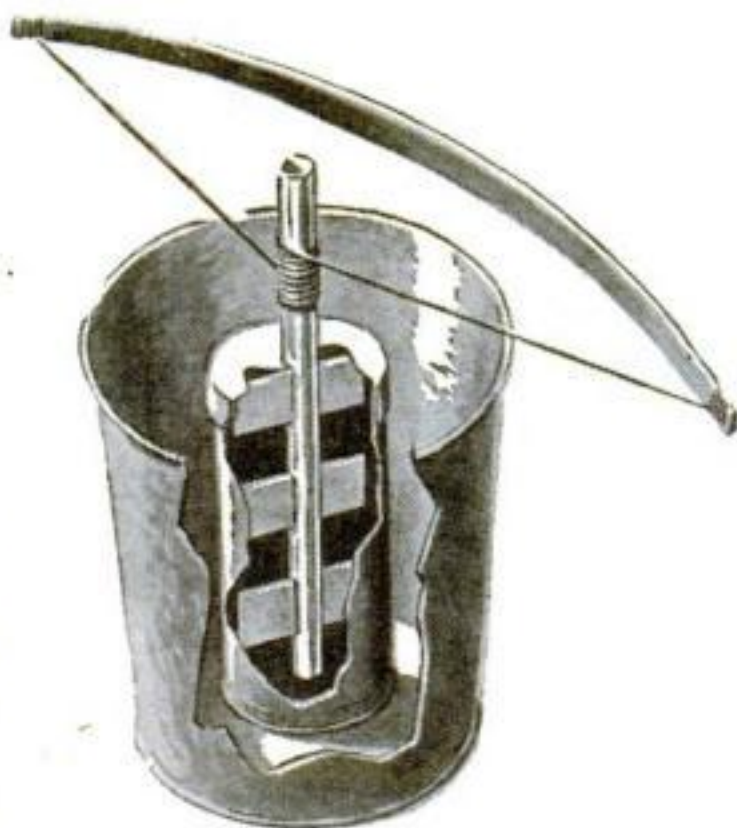


OVENS, like practically everything else the prisoners made for themselves, were fashioned laboriously from old food containers. There were two types, both to be attached to camp heating stoves.



FLATIRONS were tin boxes which were filled with hot coals. Two styles are seen above. The prisoners had such clothes as they were captured in, plus some "booty" garments of various kinds that the Germans seized and issued to them. They did their own washing and pressing.

ICE-CREAM FREEZER was one of the most elaborate kitchen utensils produced by the "kriegies." Tin paddles attached to a tube were rotated by pushing the bow to and fro. Ice cream was enjoyed only in the winter, when ice was plentiful—outdoors. All the tin used came from containers no bigger than coffee cans, cut and joined as shown below.



through the bomb bay and lit in a tree beside German headquarters. Looking back, he saw his own plane explode and the rest of his squadron disappear beyond the horizon. "Boy," he says, "I sure felt lonely."

But the Major was luckier than many kriegies (war prisoners of the Nazis). He learned the next morning that his crew was safe. He was questioned cunningly and paraded before French and German civilians. But he was not tortured, and he believes the Luftwaffe's prison camp at Sagan, southeast of Berlin, in which he was confined for the next eight months, was one of the best in Germany.

Even so, the food at this camp was neither good nor sufficient. But at first each man got a Red Cross parcel once a week, and Orris received one of the two dozen packages that his family sent, and about a fifth of the mail addressed to him from America.

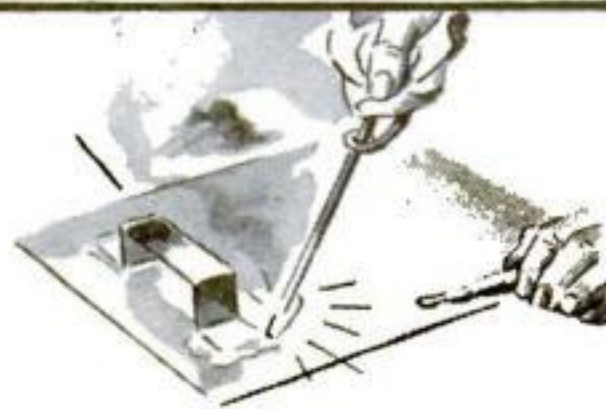
With tin cans as shovels, the boys leveled two baseball diamonds for themselves and cleaned out a water tank to swim in. But they soon talked and dreamed more about food than about sports or home or girls. Planning future menus was a favorite occupation, and Orris is carrying out those plans now. While talking to POPULAR SCIENCE MONTHLY'S editors, he lunched on a fruit cocktail, two helpings of roast duck with all the



JOINTS like this were used in patching together the tin taken from food containers.



CUTTING of tin was managed with a knife blade stuck into a floor crack and worked to and fro like a can opener.



SOLDERING. Specks of solder salvaged from can tops were applied with rods made from the handles of jam buckets.

trimmings, and a strawberry shortcake smothered in ice cream.

On a typical day while he was a PW, his breakfast was a cup of poor coffee and two slices of toasted but sour black bread, as thin as Melba toast. Lunch was another slice of bread and a bowl of barley soup as tasty as dishwater. And the day's big meal was half a bowl of potatoes and cabbage with just enough meat to whet a soldier's appetite.

The kriegies were required to punch two holes immediately in every can of food they received from the Red Cross. This was to keep them from saving some for attempts to escape. Another result was that much of the food spoiled, and many men had dysentery.

When a rabbit came through the barbed wire, 70 or 80 of the imprisoned airmen would chase it like dogs. Even three cats that were pets of the prisoners were sacrificed after days of discussion and planning. One man was detailed to stun each cat with a club, another to skin it, and so on. The first man did not hit his cat hard enough, and it got away, but finally the disagreeable job was done, and the men who ate the cat meat said it was good.

The Germans let them have gardens, which they spaded and raked with tin cans. But the soil was miserable, and American officers solemnly followed the horses whenever a wagon entered the camp, waiting for manure. They even built a trap to jolt the cart that carried waste away from the latrine, and salvaged the stuff that spilled out as fertilizer.

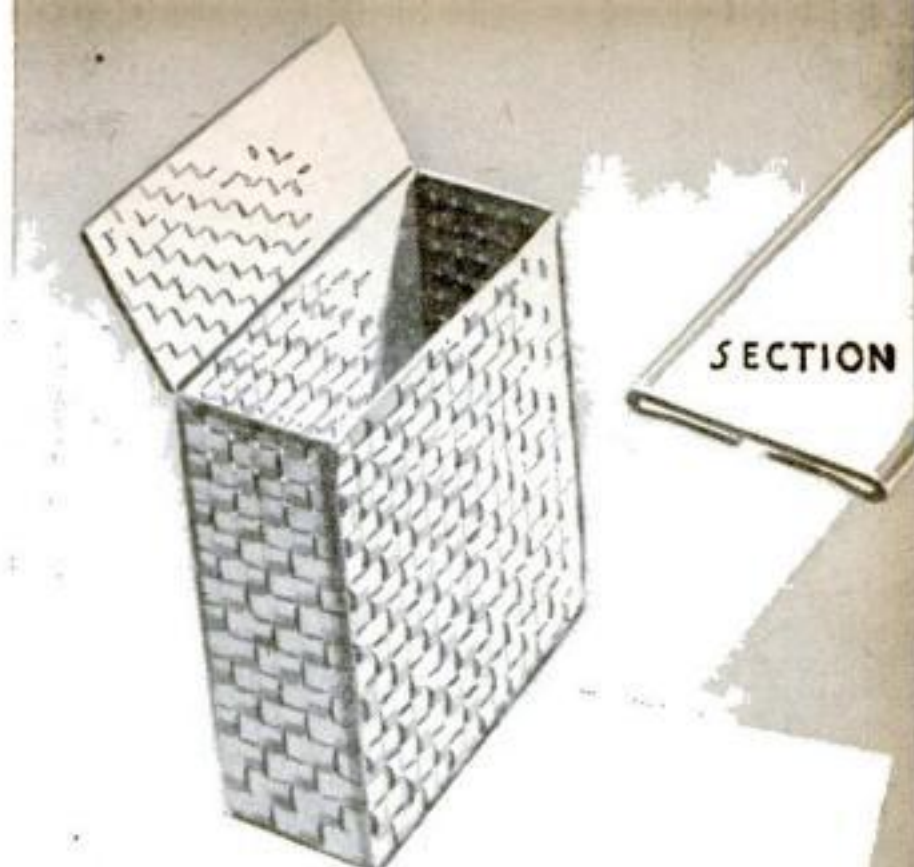
When a kriegie found a nail, he kept it in his watch pocket and took it to bed with him, because it was a precious tool. They had table knives, forks, and spoons, but no pliers, screwdrivers, or hammers. Yet, in addition to doing their own cooking, they had to improvise the utensils.

Their cooking was economical. They saved prune pits, for example, extracted the seeds, and cooked them in margarine to make a dessert. "It tasted like almonds," says Major Orris. Coal was so scarce that they dug up stumps and roots from the prison grounds for fuel, and made "kriegie burners" out of tin cans. These were tiny contraptions that enabled them to get the maximum heat from leaves and twigs.

These PW's could not buy anything, but they ran a store where they swapped whatever they happened to have. The storekeepers set point values on everything, and some men soon learned to play the market. When smokes were fairly plentiful, they stocked up with cigarettes, held them until the point value rose, then traded them for soap or whatever else was offered.

Others turned to handicrafts. Some saved metal from the tops of cans, made molds from AAF insignia, and cast new badges for those who had lost the wings from their shirts. A popular variation was an insigne with one wing clipped off and a tiny eight ball hung on a chain in its place.

Some men made knit- [*\(Continued on page 218\)*](#)



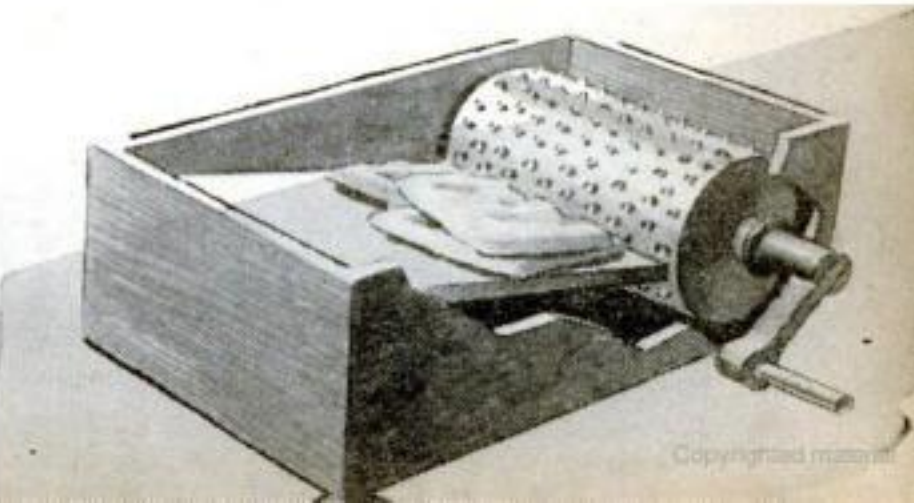
CIGARETTE CASES woven of tin strips were among the fanciest products of kriegie handicraft. Tin was cut into narrow strips, turned over at the edges as seen in the sectional view, and woven.



POTS AND PANS were fabricated by cutting tiny notches in the edges of a sheet of tin. These could be folded over a circular piece set into the bottom. Prisoners' only tools were table knives, forks, and spoons.

PERCOLATOR fashioned in this manner gave Yanks their breakfast coffee. A nail was used in punching the holes for the basket. Nails were treasured. If a prisoner found one, he put it in his watch pocket and took it to bed.

CRACKER MILL provided flour for making pies. Crackers were pressed against a rotating cylinder on which teeth had been raised with a nail. Flour dropped into the bottom section.



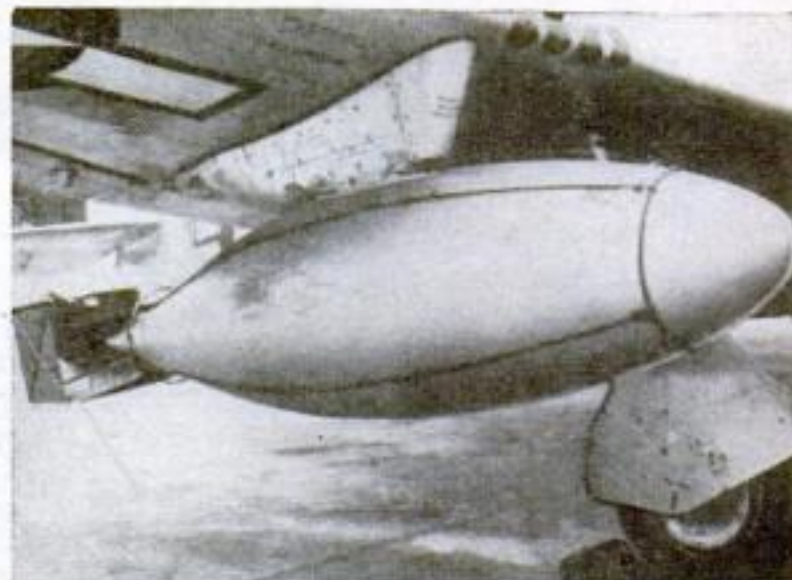
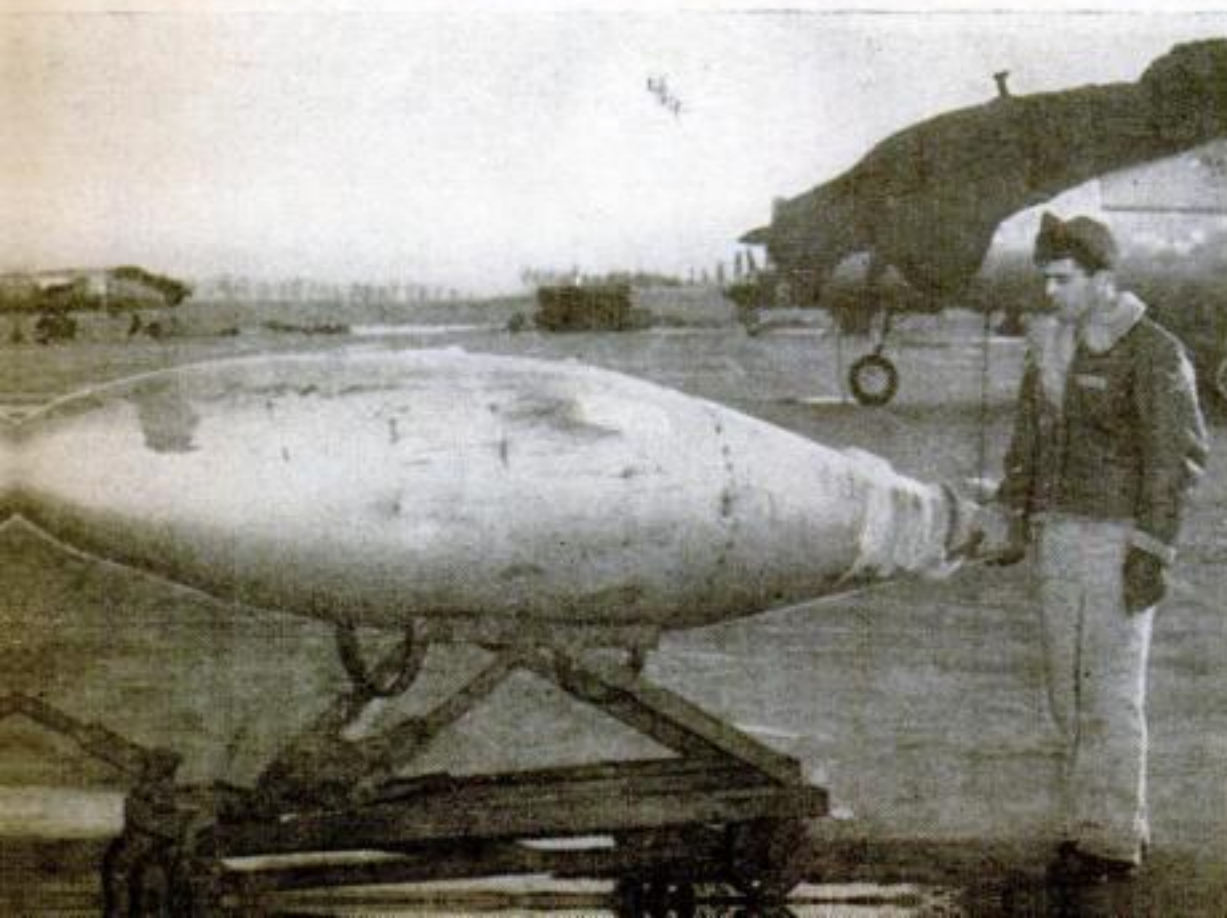


HOPPICOPTER is the name given this first really personal flying machine by its inventor, Horace T. Pentecost, of Seattle, Wash. Resembling a helicopter, it is powered by a 20-horsepower, two-cylinder engine that is strapped on the "pilot's" back. He operates the flight stick with his right hand and the throttle with his left. The CAA has licensed the device as an experimental type of aircraft, and the inventor plans flight tests.



"BALL O' FIRE." Auxiliary fuel tanks filled with jellied gasoline (P.S.M., May '45, p. 100) have proved highly effective as incendiary bombs in the Pacific. Carried under

the wings of P-47 fighters like ordinary jettisonable tanks, they explode on striking the ground and splash flaming gobs of gel over a large area.

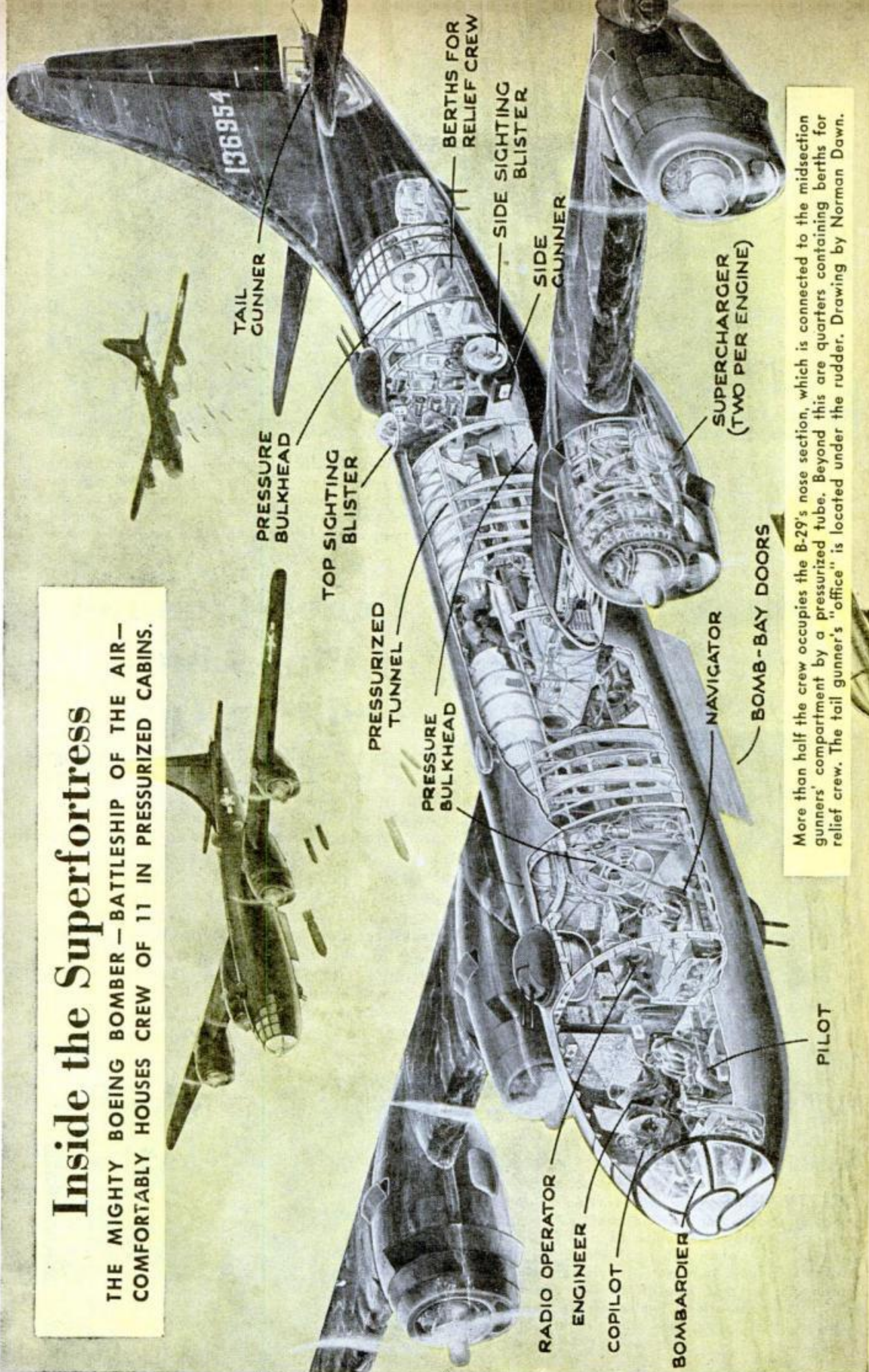


The gasoline in this P-47 wing tank is the jellied kind. The tail fin (above) makes it fall like a regular fire bomb.

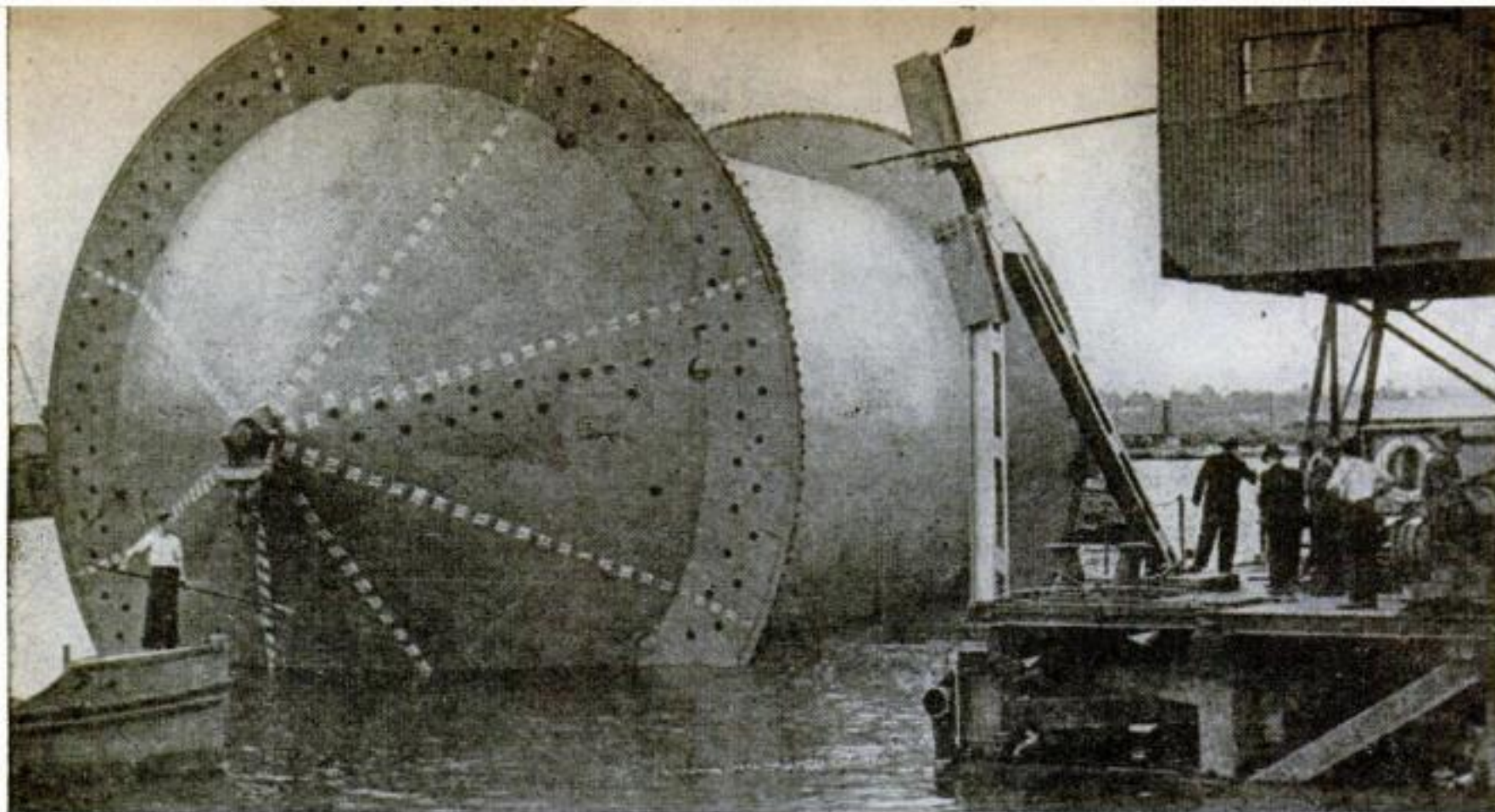
POPULAR SCIENCE

Inside the Superfortress

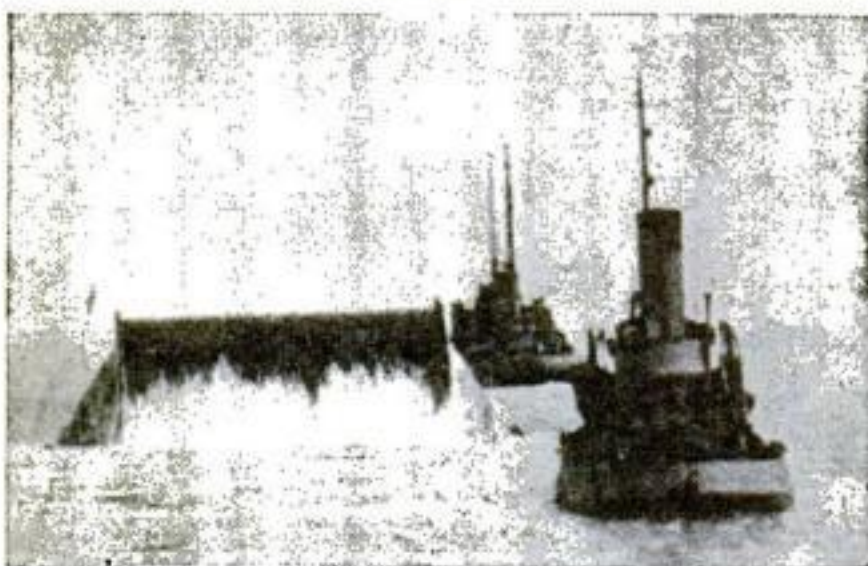
THE MIGHTY BOEING BOMBER—BATTLESHIP OF THE AIR—COMFORTABLY HOUSES CREW OF 11 IN PRESSURIZED CABINS.



More than half the crew occupies the B-29's nose section, which is connected to the midsection gunners' compartment by a pressurized tube. Beyond this are quarters containing berths for relief crew. The tail gunner's "office" is located under the rudder. Drawing by Norman Dawn.



"CONUNDRUMS," huge reels on floating docks, were wound with steel pipe welded together into a continuous length of 70 miles. The 1,600-ton loaded spools were then towed across the Channel, as shown at the left, paying out pipe as they went.



Under-Channel Pipe Lines Fed Our Tanks

TWENTY pipe lines laid under the English Channel, 16 of them about 30 and four about 70 miles long, pumped some 120,000,000 gallons of gasoline to the British and American armies between August 12, 1944, and VE-day, it has been revealed. Pumps concealed on the English coast pushed the fuel through the underwater pipes to the French shore, from which high-pressure lines carried it on to the Rhine. Two kinds of pipe were used under the Channel, one of steel, the other resembling underwater electric cable. Both were three inches in diameter and could stand a pressure of 1,200 pounds to the square inch.



LIBERTY SHIPS laid another kind of pipe resembling underwater electric cable. A 10,000-ton vessel could stow 100 miles of pipe in her hold (above). The photo at right shows the flexible cable being paid out over a drum set in a hatch of the S.S. Latimer, one of the two Liberty ships used in the operation. Twelve of the cables laid were of this type; the other eight, of steel.



Pershing Tank Packs 90-mm. Punch



A 16½-pound projectile from this 90-mm. gun on the Pershing will pierce 14 inches of armor at 300 yards. Firepower also includes two .30 caliber machine guns and one .50 AA gun. (Official U. S. Army photo.)

AMERICA'S new General Pershing, or M-26, is the Joe Louis of tanks. It is neither the biggest nor the heaviest tank of World War II, but has what is needed to outfight any other tank. The function of a tank is to provide firepower, mobility, and crew protection for offensive action, and its value must be judged on this basis.

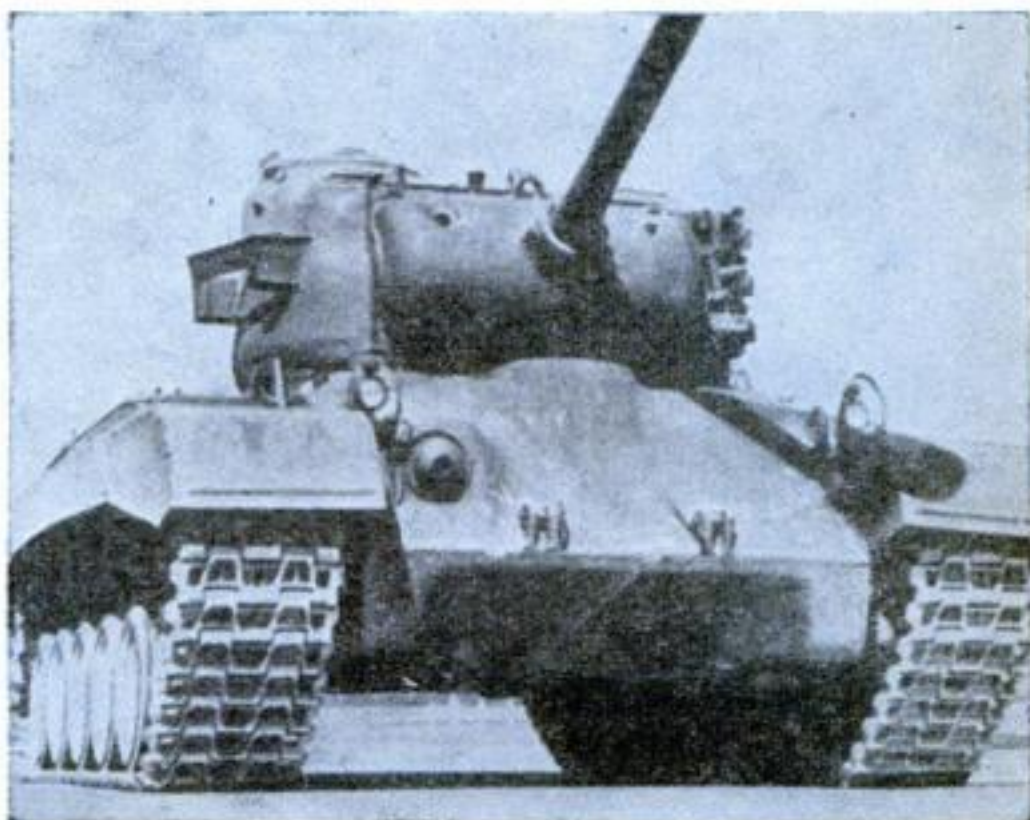
The Germans' 60-ton Tigers and 75-ton Royal Tigers had 88-mm. guns (P.S.M., June '45, p. 68). But the 45-ton Pershing carries a 90-mm. gun, with such high muzzle velocity and armor-penetrating power that this tank has been nicknamed the "Tiger Tamer."

The Pershing is driven by an eight-cylinder, 500-horsepower engine, has a top speed of 25 miles an hour, and can negotiate grades up to 60 percent. Its moving tracks are two feet wide. Torsion-bar suspension makes this monster ride smoother than its predecessors. The fluid drive is similar to that used in automobiles, and the tank is steered with levers. Dual controls make it possible for the assistant driver to

take over its operation promptly if the driver is put out of action.

Its crew of five is protected by front armor and a gunshield four inches thick, and by inch-thick armor in back. The M-26 is 19½ feet long, 11 feet 2 inches wide, and only slightly over nine feet high.

Four-inch-thick armor, sloped for maximum protection for its weight, covers the front of the new M-26. (Signal Corps photo.)

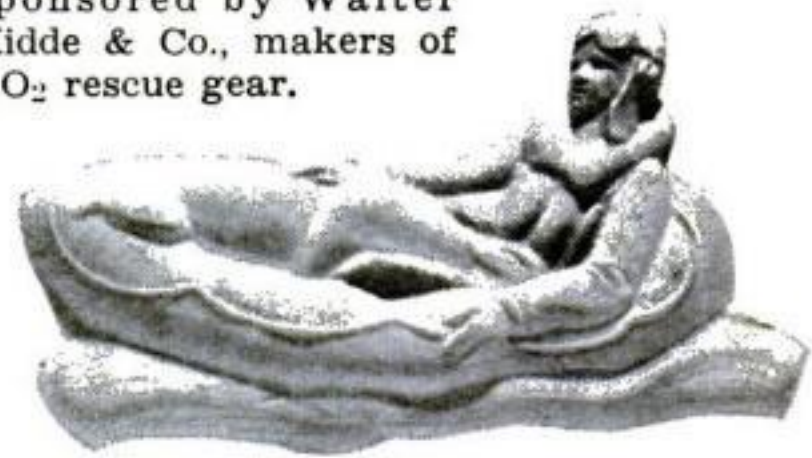


WHAT'S NEW



JAP BALLOON BOMB. U. S. Army officers and a G-man examine a bomb that drifted onto the American mainland under a 33-foot paper free balloon. Released in Japan or possibly from submarines, such bombs apparently were designed to start forest fires.

SEA SQUATTER'S PIN will be worn by United Nations airmen who have been forced down at sea. It is the emblem of the Sea Squatters Club sponsored by Walter Kidde & Co., makers of CO₂ rescue gear.



B-29 IN DOGHOUSE. This Superfortress is receiving skin treatment preliminary to conversion into a F-13A super photo-reconnaissance plane at the Continental-Denver Modification Center. The "doghouse" protects workers from the weather. In the winter, such shelters are heated by blowers of the type used for warming plane engines.



IN AVIATION



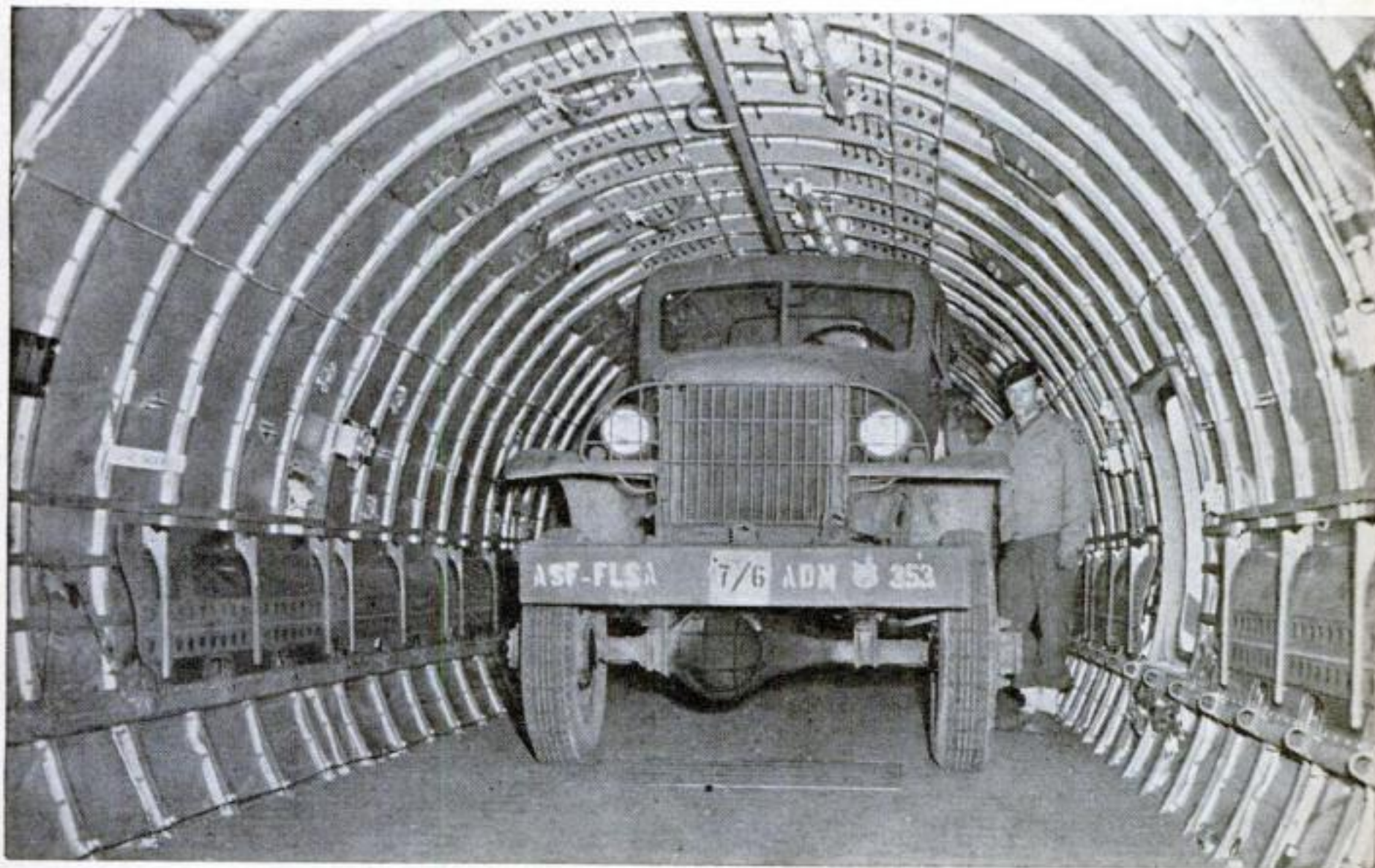
ERNIE PYLE, America's late beloved war correspondent, has a namesake in the form of a B-29 Superfortress. The big plane was

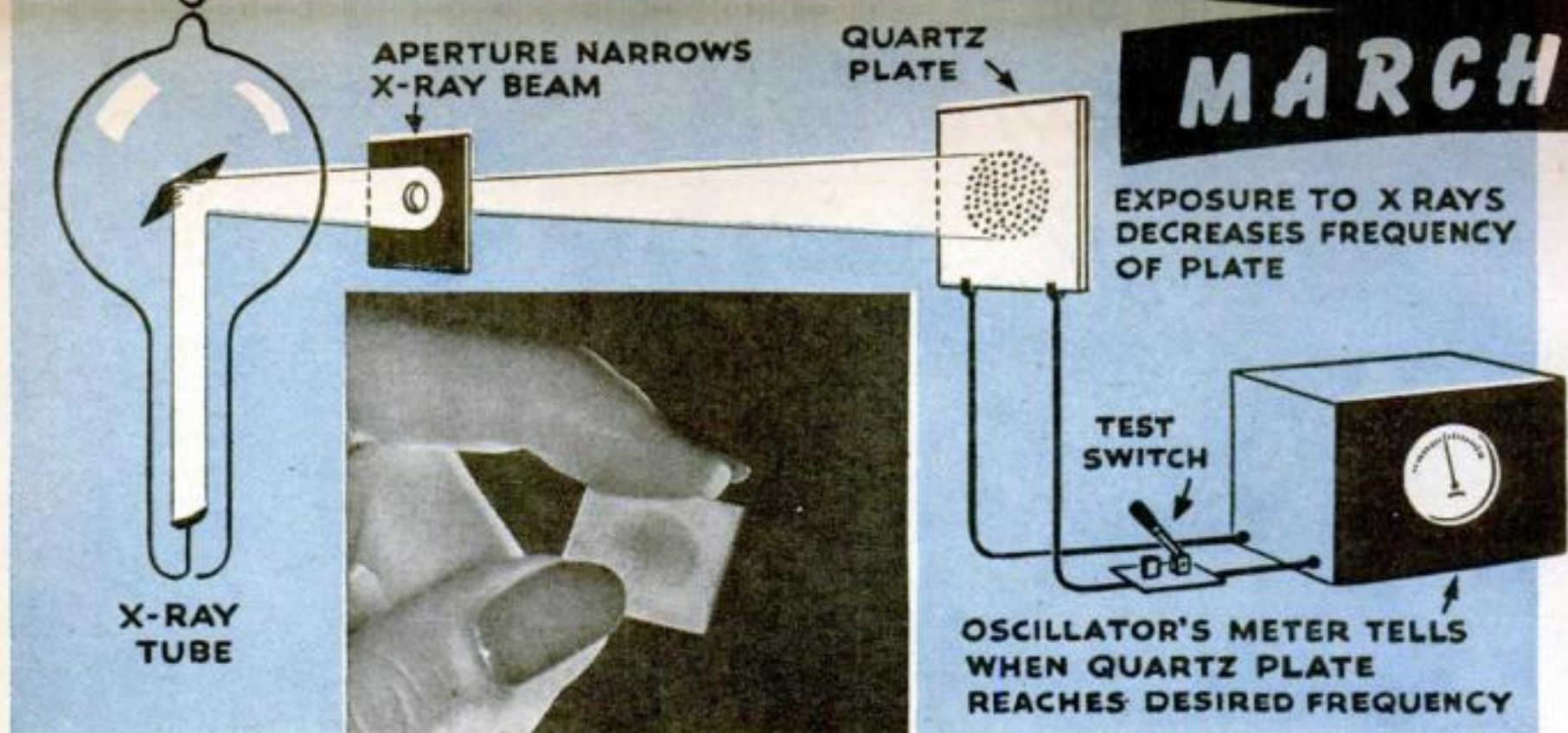
paid for through purchases of War Bonds by employees of the Wichita (Kan.) Division of Boeing Aircraft Co., where it was built.

WRAP-AROUND LITTER of canvas reinforced by hardwood strips enables a wounded man to be removed safely from cramped quarters in a bomber.



INSIDE THE C-97. Below, a 2½-ton Army truck is parked in the upper fuselage section of the cargo version of the B-29. Two such trucks can ride this main deck, with other equipment, while personnel or cargo is carried in two lower compartments.





X RAYS ADJUST FREQUENCY of paper-thin quartz plates, indispensable as control units in high-precision radio transmitters and receivers. The process, of which the general principles are shown in the drawing,

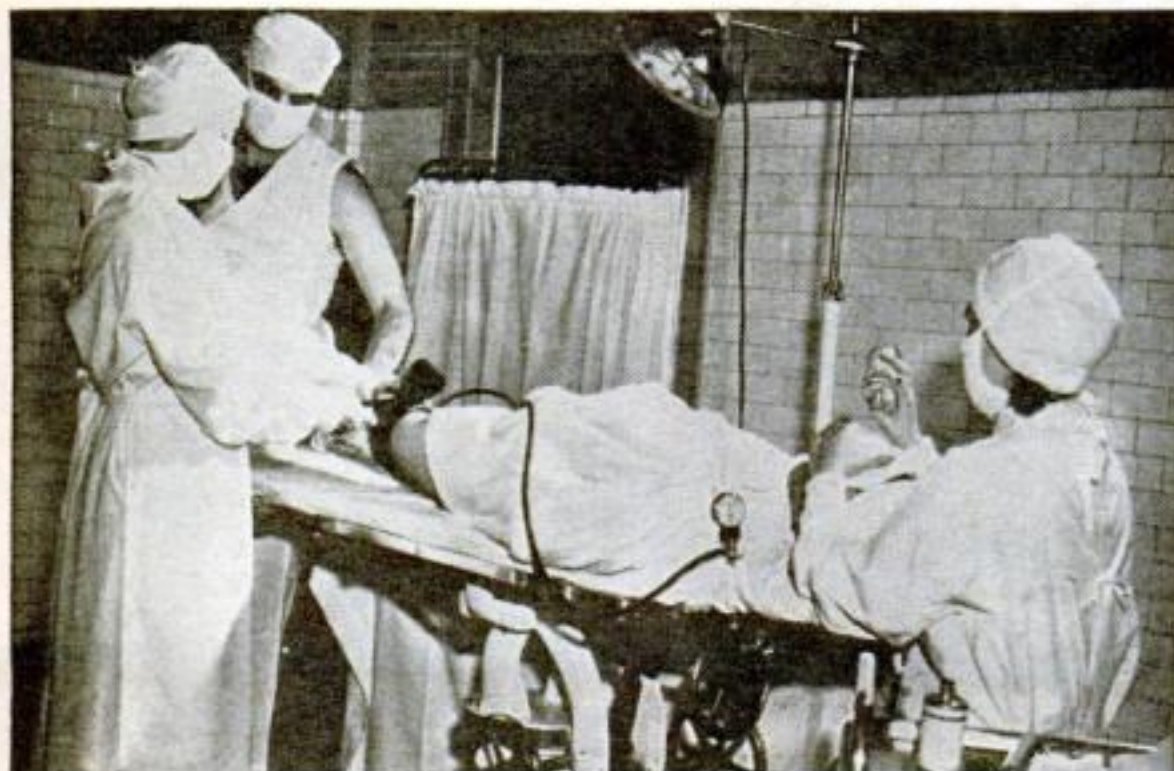
eliminates time-consuming hand grinding and uneven chemical etching. Effect of X rays on crystalline substances was discovered by Dr. Clifford Frondel of the Reeves-Ely Laboratories, New York City.



PEANUT WOOL, a synthetic fiber called ardil, has been developed by the Imperial Chemical Industries, Ltd., after 10 years of experiments. It may be woven with real wool, cotton, and rayon for the manufacture of inexpensive textiles. The synthetic fiber is made from protein from the peanuts after oil for industrial uses has been extracted. David Trail, ICI scientist, says it will be cheaper than pure wool, with all the cold-resisting properties.

PNEUMATIC TOURNIQUET, with a gauge dial to indicate pressure, almost totally eliminates the danger of post-operative gangrene, which frequently develops from use of manual tourniquets. The anesthetist inflates the device as incision is made and

controls pressure throughout the operation (left, below). Tourniquet (right, below) consists of a rubberized fabric tube which is reinforced by a belt of the same material. It was developed by Dr. Harold R. Conn and is produced by Goodyear.



MOSQUITO LOVE SONGS are being "canned" on phonograph records by scientists at the Cornell University Medical School. Mating calls of insect Sinatras and Ginny Simmses may be used to lure disease-bearing pests into traps.

Often only faintly audible to human ears, the insect sounds were greatly amplified for recording. Practice enabled the experimenters to distinguish between the songs of different genera, and between those of males and females. Running true to form, the females' voices are louder and more highly pitched than the males'.

A mosquito will not sing without an audience. Even a male quartet may refuse to sing until a female comes along; then they break out with the mosquito equivalent of "Sweet Adeline."



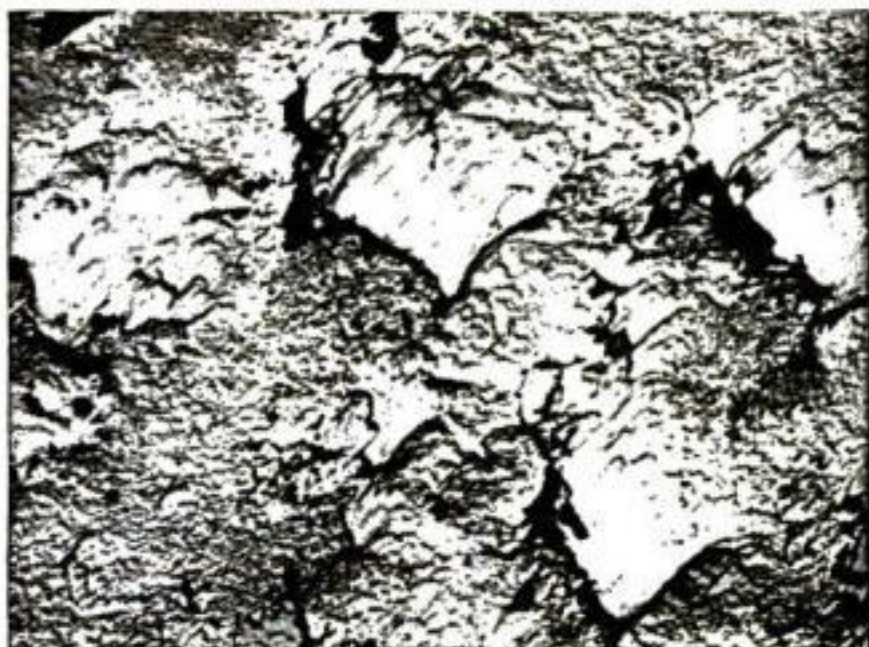
PEA SEEDS from the tomb of King Tut bear fruit! Three kernels given to an American Army officer yielded 1½ pounds of fresh peas.

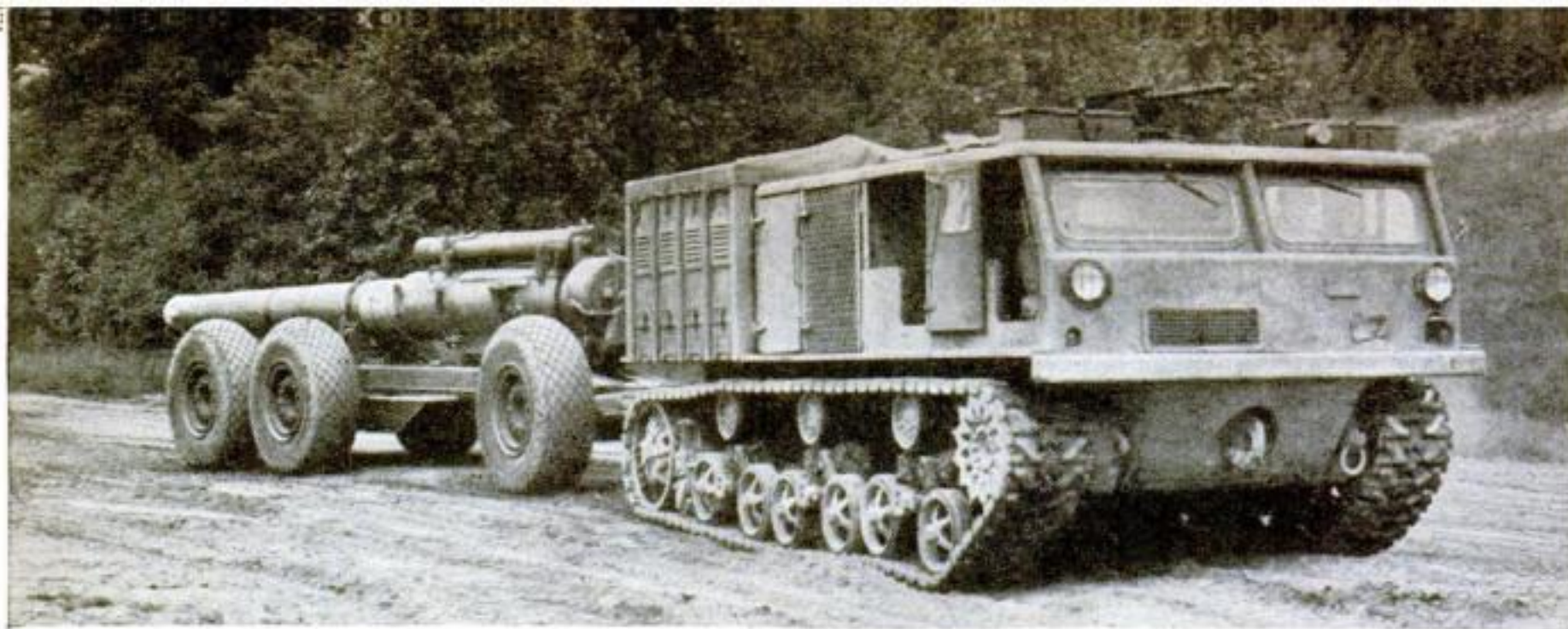
Some of these were sowed, and, while producing a healthy crop, were not attacked by pests which chewed up neighboring plants.

The bug-resistant King Tut peas have a distinctive walnut flavor, and may prove to be more valuable than the jewels found in the tomb.

TEETH HAVE CANALS. Every one of your teeth has about 50 miles of canals. This fact is revealed by the RCA electron microscope, which has a magnification up to 100,000 times. The mountainous-looking area on the left, below, is the enamel sur-

face of a normal human tooth, magnified 5,300 times, disclosing irregularities of structure never before seen. The other picture is a cross-section shot showing canals in the dentine, and openings which appear as huge craters.





↑ **NEW**

Daddy of 'em all is the new American 240-mm. howitzer. This "Black Dragon," hauled in two parts by 38-ton tractors, can race over rough terrain at 21 miles an hour, be emplaced with a truck crane in 1½ hours, and shoot 360-pound shells over 14 miles.

↓ **OLD**

Compared with the new howitzer, the old 240 (below) moved at a snail's pace. It had to be broken down into four sections, carried on solid-tired wagons that were pulled by slow tractors, and could not be emplaced in less than four hours, mostly by handpower.



Biggest Gun on Wheels

By JOHN E. LODGE

CHAMPION of heavyweights—but with the agility of a bantam—that's the new 240-mm. howitzer which blasted the great gaps in the steel and concrete forts of the Siegfried line. Not only is the M-1 the heaviest of all our mobile artillery, but it goes into action in a hurry. All previous performance records in speed of movement and emplacement of big guns have been put in the shade by this product of U. S. Army Ordnance ingenuity. So quickly can this

monster be thrown into action that it is used on targets of opportunity as well as for demolition. That gives an idea of the gigantic stride represented by this weapon.

Mobility is the middle name of the 240-mm. howitzer. It moves in just two parts, drawn by 38-ton tractors, at 21 miles an hour, the 12½-ton barrel riding on one six-wheeled transport wagon and the 20-ton carriage on another. With their 18 x 24 pneumatic tires and high-speed axles, the transport wagons are a far cry from the slow-moving, solid-tired trailers that were

CLAMSHELL bucket on the crane digs the recoil pit. The crew formerly did this job—with shovels.

HUGE CARRIAGE is lifted to be set down over the pit. The carriage was unbuckled in one minute.





The 12½-ton barrel (on left, above) and the 20-ton carriage (right, above) make up the heaviest mobile gun now in use.

Its mobility was limited, its range five miles less, and its rate of fire from two to three times slower than the new gun.



Rough-riding trailers bear the shells to feed the huge M-1. Each carrier hauls 32 rounds, enough for about half an hour.

Gains Speed and Punch

used to carry the old-model howitzers.

When it comes to getting the new gun into action, the methods and means are equally modern. A huge truck-mounted crane digs the recoil pit in a fraction of the time formerly required by men with shovels. The same crane picks up the carriage and the barrel with ease and sets them in place. With this up-to-date equipment, the big howitzer is ready to fire in a little more than an hour. The old one could not be emplaced in less than four hours under

CRANE now picks up the barrel to set it on the carriage. (Right) M-1 is ready for action.





OLD

It took valuable time—hours of it—and plenty of elbow grease to dig a recoil pit for the old howitzer.

the most favorable conditions. It was almost all hand work.

When the new howitzer goes into action, its performance is likewise far superior to that of its predecessor. Its range is 14



Power-driven winches were some help in setting up the old gun, but it was also tug and pull for artillerymen to line up and fix each section in place.

miles, against nine. Its rate of fire is three times as fast, its projectile heavier. The gun itself can be swung in either direction $22\frac{1}{2}$ degrees from center, as against 10 degrees for the old one. The added area of

NEW

Everything is geared to speed in emplacing the mighty M-1. And before each is sent to a battlefield it is put through its paces in this country. The gun shown here was pictured as it was being set up and tested at the Aberdeen Proving Ground in Maryland.



1 Only two pairs of turnbuckles hold the gun's carriage to the transport wagon. These can be loosened quickly to free the carriage.



2 Meantime, each of the four mammoth spades that brace the carriage against recoil is quickly tightened into place. In the field, pit is not plank-lined.



3 Easy does it. Special connections at the center of gravity make the job of lifting the 20-ton carriage a smooth operation. Set a few hooks—it's off!



4 With equal speed the barrel is swung from its wagon by the powerful crane over to the waiting carriage.



5 Then the long tube is maneuvered into the ready-made fittings on the gun carriage and locked in place.



6 The 360-pound projectile is put into the trough that guides it into the breech. A 240-mm. shell is almost $9\frac{1}{2}$ inches in diameter.



GIs then strained to adjust the awkward monster's fittings. In fact, the whole operation was slow motion compared with the crane-operated equipment.

enemy territory brought into range is immense.

About the only similarity between the new and the old guns is the caliber of 240 millimeters, slightly under 9½ inches.

So quickly can this monster be thrown into action that it is used on moving targets as well as for demolition work. And its functional simplicity helps to explain why our men in the field defeated the Germans, who were the tops in artillery for nearly a century. The Yank is the new master in the big-gun field.



Even drawing the old 16½-foot barrel into place was a laborious task. Today, the crane handles the 27½-foot barrel as easily as a man lifts a cigar.

All in all, the new 240-mm. howitzer M-1 simply spells more destruction for the enemy, more protection for our men. It's an artillery ace-in-the-hole in the hand held by American forces.

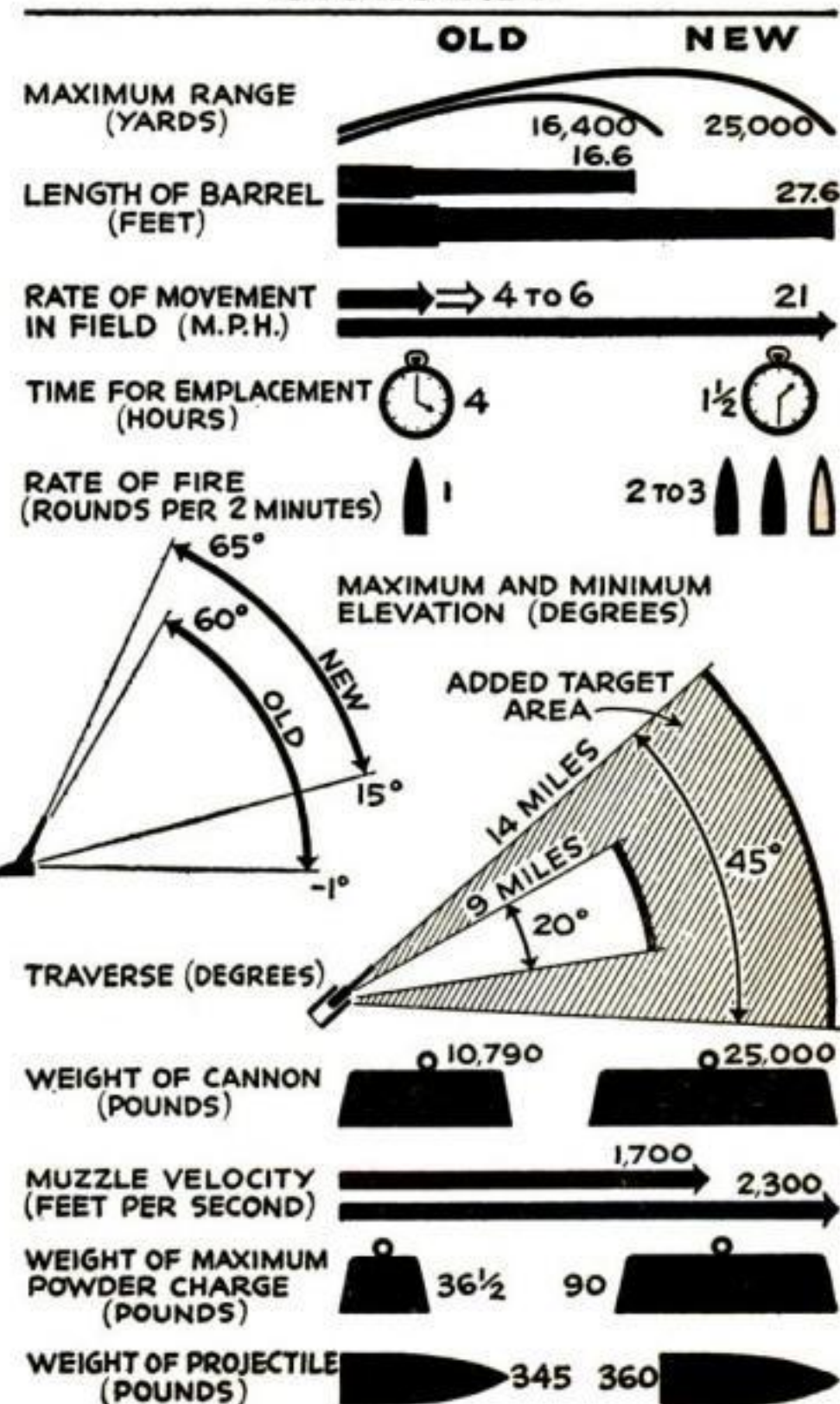


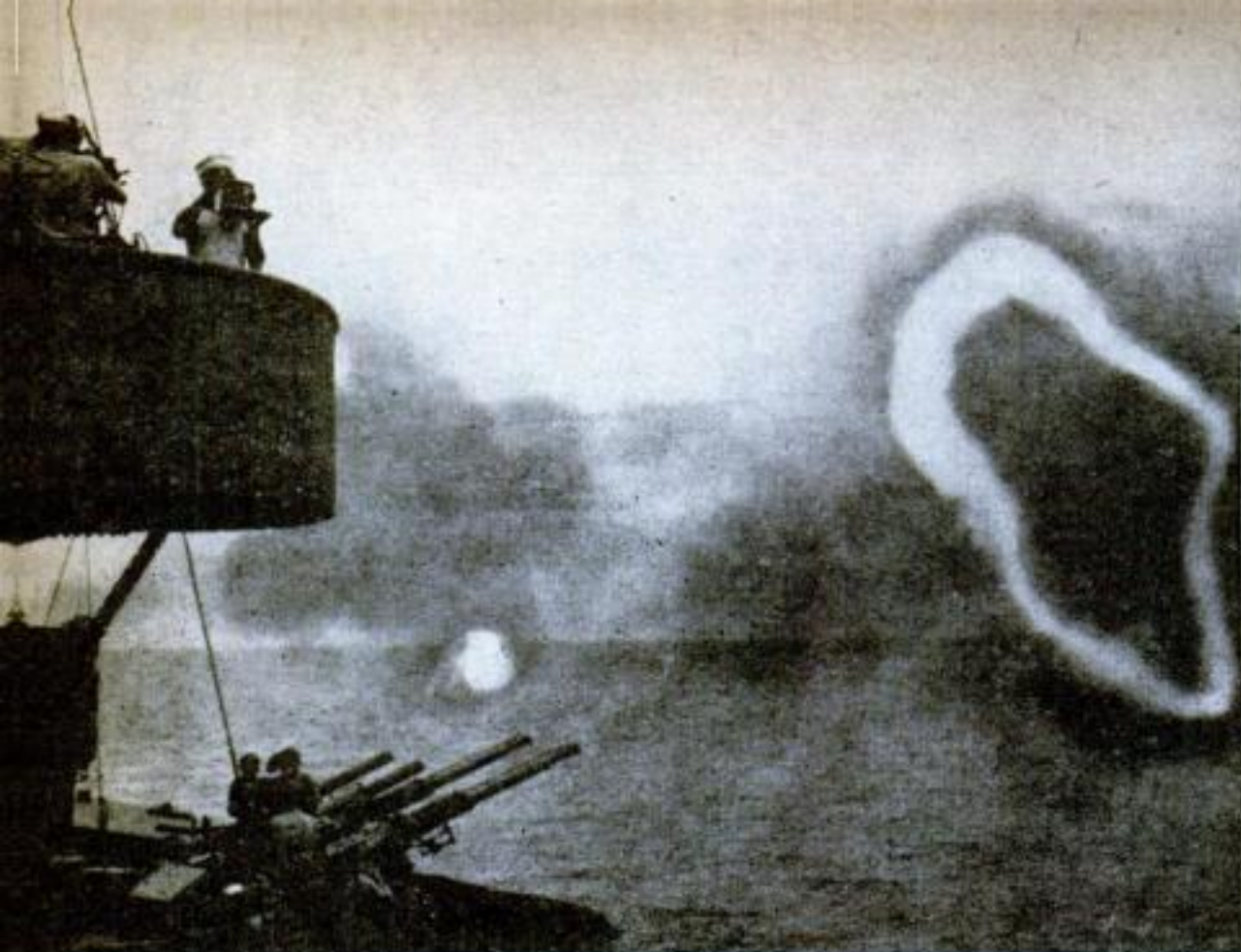
7 (Above) With 90 pounds of powder behind the shell, the breechblock is closed.

8 (Below) A GI works the elevator mechanism. When everything is ready—BOOM!



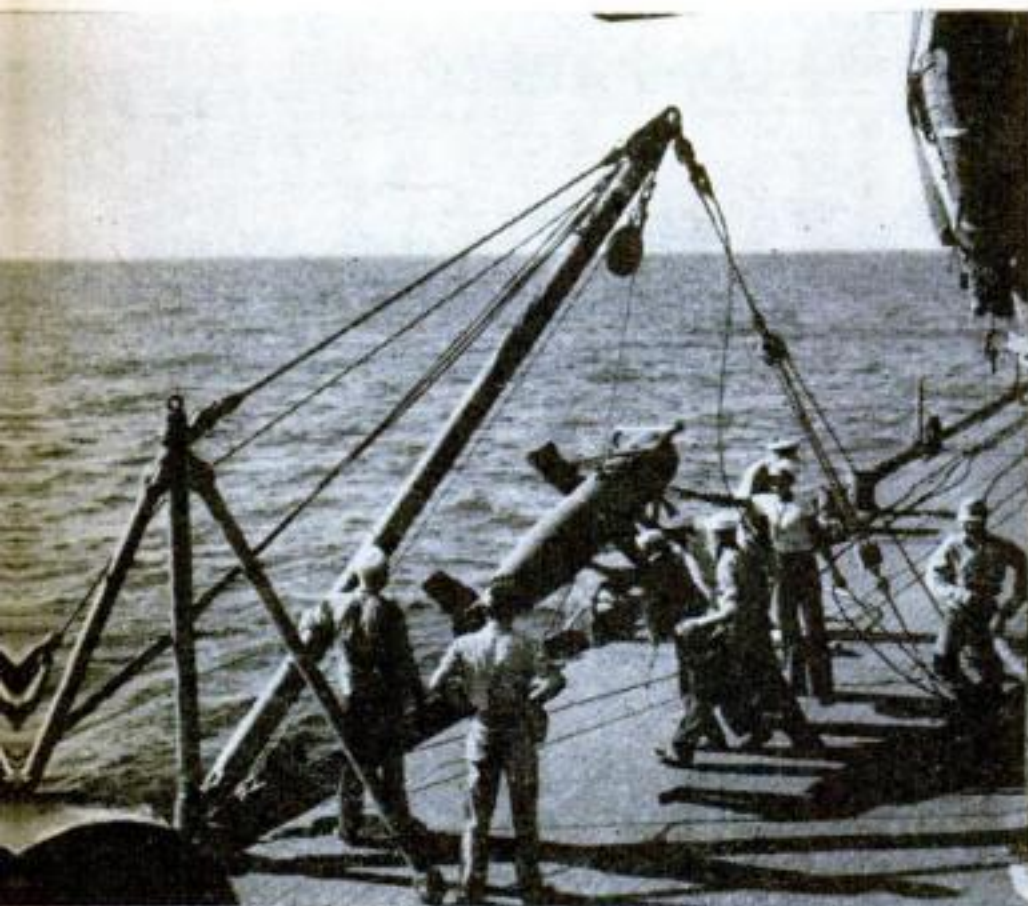
OLD AND NEW 240-mm. HOWITZERS COMPARED





THIS FLAMING RING and fireball were coughed out, not by the Bofors guns at lower left, but by one of the ship's 12 six-inch guns. No targets are used for the big guns, the weapons being fired solely to test operation and train gun crews.

PARAVANE DRILL. Seamen launch the fishlike drag which, towed from the bow, cuts loose mines so they can be detonated by rifle fire when they surface.



THE "SHACK." Busiest room on the cruiser is the communications office. Here, amid the clatter of typewriters and sending and receiving instruments,

SHAKEDOWN

HOW SAILORS ON A NEW LIGHT

TO GIVE a new ship and a new crew a chance to size up each other, the Navy packs them off on a three or four-week jaunt known as a shakedown cruise. Neither ship nor crew wastes time giving the other the works. Among other things, the vessel is raced forward and backward, turned "hard over" to see whether her rudder jams, and swung sharply to starboard and port to make sure that her compasses all give the same reading at the same instant. The crew learns to take her rolls and pitches, and to

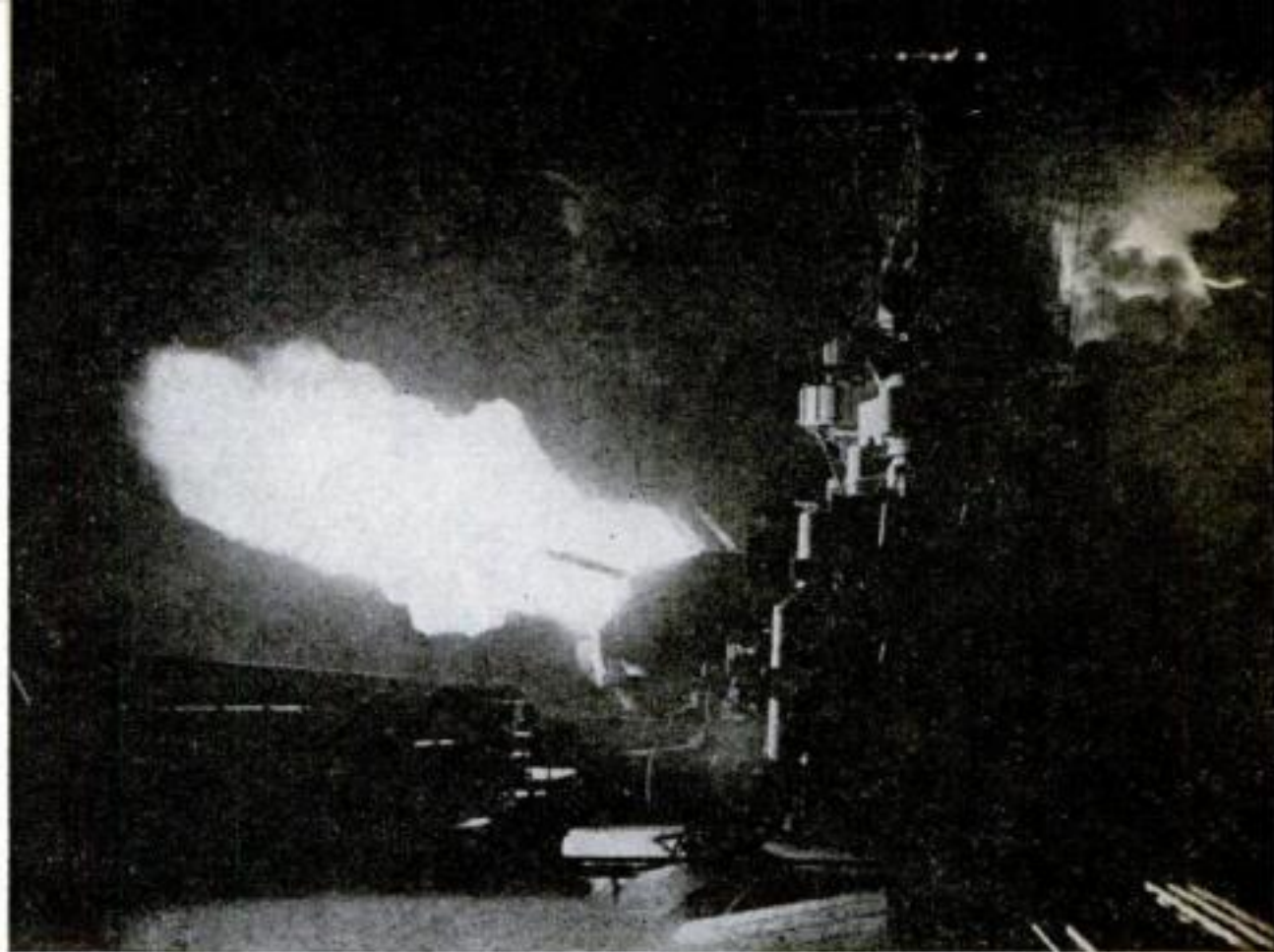
ANTIAIRCRAFT. Of the 13 very busy men at lower left, only two are aiming and firing the four 40-mm. Bofors. The rest are kept on the jump just feeding the ammunition to these shell-gulping guns.

SHELL CASES, made of precious brass, are saved for use again. A net snags the five-inchers as they are dropped through holes in the turret floor. The shells are used against both aircraft and ships.





highly trained specialists maintain contact with bases and other ships. By means of intraship phones, the shack also keeps in touch with various parts of the cruiser.



NIGHT FIRING is done to accustom the gun crews to the blinding flash as well as the terrific bark and jolt of the six-inch guns. One bone-jarring test of a shakedown is to let all the starboard or port-side guns go off at the same time.

CRUISE...

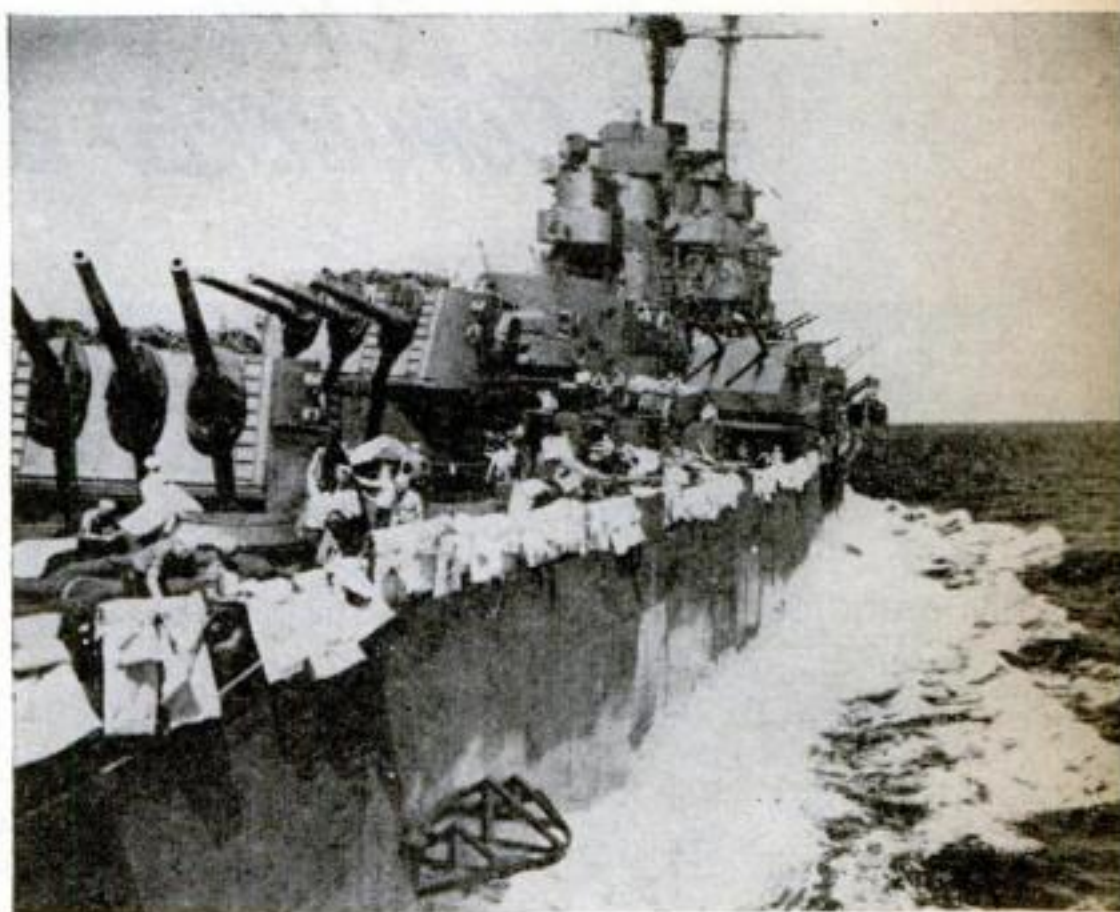
CRUISER FIND THEIR SEA LEGS

stand firm when she lets go a mighty salvo of her biggest guns.

These official Navy pictures were taken on a recently commissioned light cruiser. Reliable unofficial sources reveal that she is a 10,000-ton ship of the *Cleveland* class, with a speed of 33 knots. She carries 12 six-inch guns, 12 dual-purpose fives, and a number of 40 and 20-mm. ack-acks. Without her armor, she cost about \$18,000,000. On her shakedown she carried 400 men above her normal 888.

THREE 20-MM.-GUN CREWS (lower right) gang up on a plane-towed target and blow it full of holes. The same kind of target is used for the cruiser's dual-purpose five-inch guns.

IF AN ENEMY SHELL knocks out the communication lines from the range-plotting room, a gun-crew captain can pop his head out of the turret and do his own aiming with these sights.





YOU HAVE A
NASTIER COLD
THAN YOU THINK!

Now **VIRUS**^{*} IS BEING CONQUERED BY MEDICAL SCIENCE

* MAN'S DEADLIEST ENEMY

In one week not long ago, 32,000,000 Americans contracted colds. It has been estimated that colds cost us 800,000,000 man-days of labor a year. Now, at last, we can see this enemy and plan its ultimate defeat.

By JOHN GILMORE

Drawings by the Author

INFLUENZA has defied penicillin, sulfa drugs, and dozens of other new microbe killers—but the thing that causes it can now be seen. So there's really more reason now than ever before to hope that science soon will win its long war against influenza, the common cold, and the many other ailments caused by extremely tiny viruses.

These viruses that are responsible for diseases such as virus pneumonia, infantile paralysis, yellow fever, parrot fever, measles, mumps, and trachoma range in size from only 10 to 280 millimicrons. A millimicron is a millionth of a millimeter, and a

millimeter is about a twenty-fifth of an inch.

Since these minute but deadly enemies of mankind can slip through bacterial filters, they are known as filterable viruses. Since they are beyond the range of even the most powerful optical instruments, they also have been called ultravisible viruses.

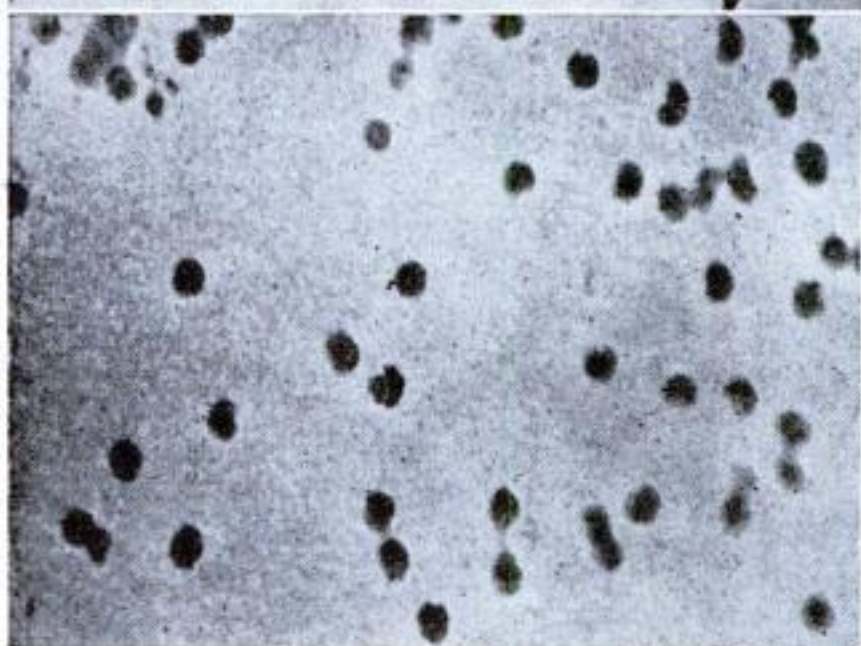
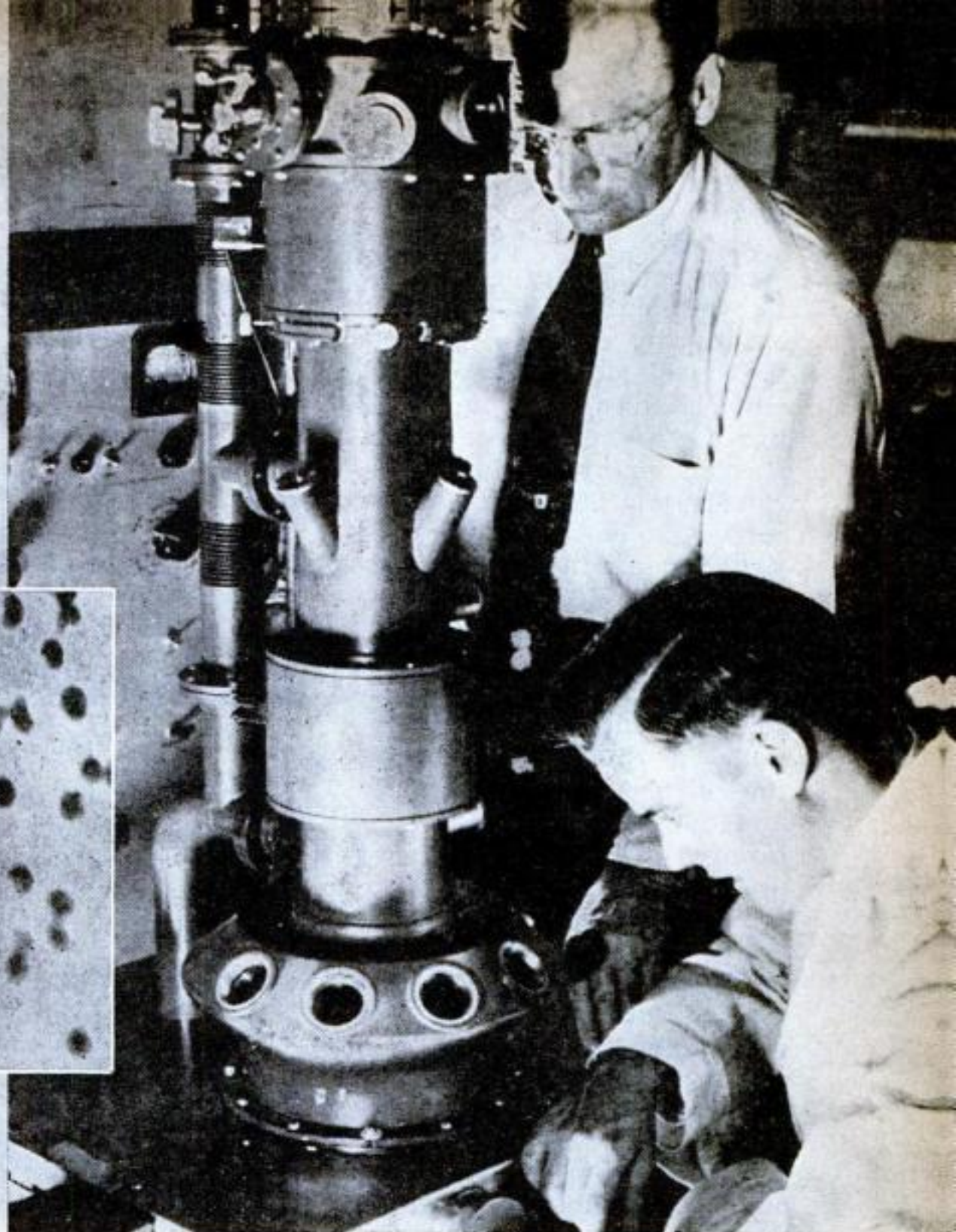
The electron microscope, however, has exposed them. It has made them visible by substituting penetrating electrons for light. A stream of these electrons is focused and directed by electromagnets. The result is extraordinary magnification of the object, an image of which is thrown on a photographic plate or viewing screen somewhat similar to a fluoroscope. While an object can be enlarged only 5,000 times by an optical microscope, it can be enlarged 100,000 times by an electron microscope.

To supplement this mighty microscope's work, two other new machines recently have been invented. One is a device that cuts material to be analyzed into slices only one twentieth as thick as the average human hair. Another is an electron micro-analyzer with which the chemical elements of a particle only a hundredth of an inch in diameter can be identified.

There is no precise definition of virus. Its most important characteristics are its small-

ELECTRON MICROSCOPE GIVES US FIRST VIEW OF INFLUENZA VIRUS

"Ultraviolet" viruses, so called because they formerly were beyond the range of even the most powerful available magnifiers, can now be seen with the aid of the electron microscope. At right is the powerful RCA instrument, with Dr. V. K. Zworykin (standing), head of the RCA Electronic Research Laboratory. Below is the first photo ever made of the influenza virus bodies



It was taken at the Duke University School of Medicine. In our reproduction, virus is magnified 27,500 times

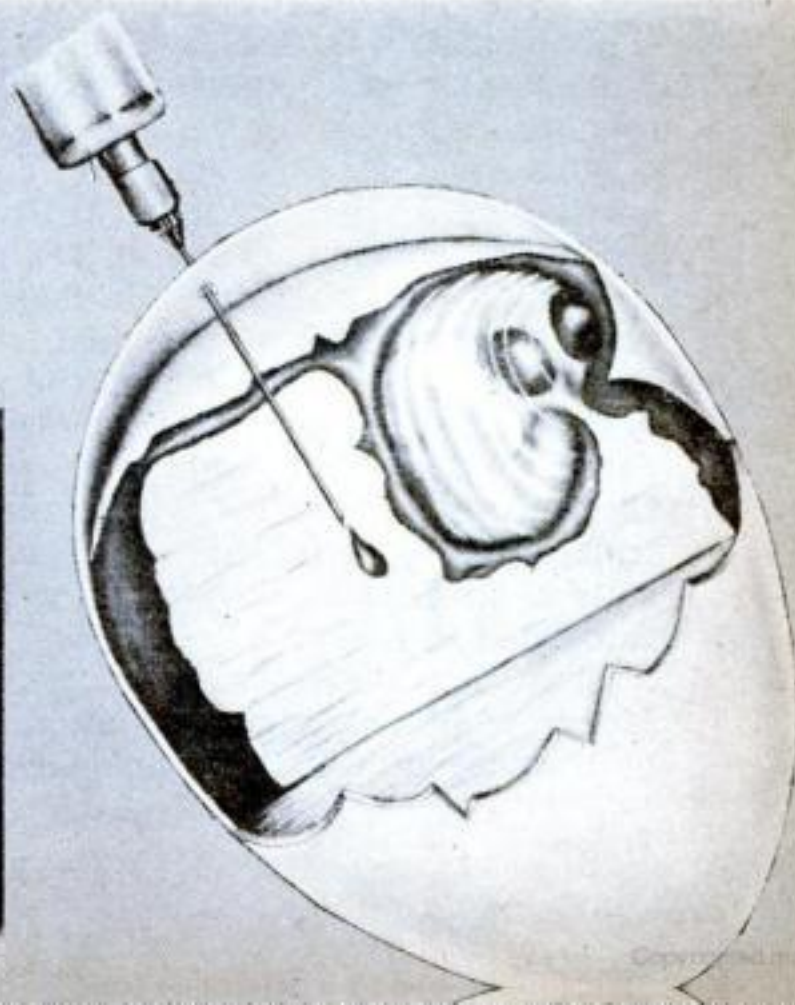
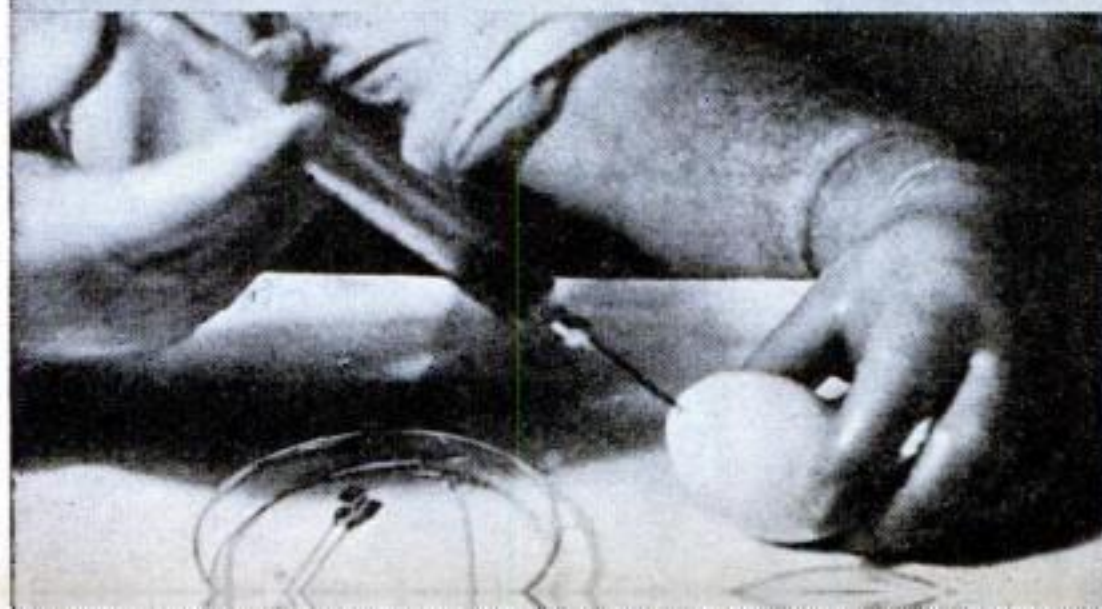
ness, its ability to grow only on living tissue, and its ability to create changes within cells. Some scientists believe that virus is the real missing link between inanimate and animate matter, with properties of both. It is definitely a living entity, because it grows and multiplies, yet a pure crystalline protein that not only contains but is composed of

virus has been obtained for scientific use.

Scientists have been certain about the existence of these filterable disease entities for only about half a century. The common cold was not traced to a virus until a few decades ago. But much progress already has been made and more is anticipated, especially in the development of vaccines to

INJECTION OF CHICK EMBRYO PRODUCES VIRUS, VACCINES

A chicken's egg is an ideal medium for growing virus for laboratory use. Virus is injected into the partly developed embryo as shown below and in the transilluminated specimen at right. In this living culture, the virus develops rapidly and is kept from contamination



WHAT JUST ONE SHOT OF VIRUS CAN DO TO AN EGG

prevent and cure virus diseases.

Research has been accelerated not only by the invention of mightier microscopes but also by the discovery that the developing embryo of a chicken's egg is an ideal growing medium for virus. A great many mediums previously had been tried to assure a plentiful supply of virus for laboratory use. Fertilized eggs now are allowed to develop for several days, then virus is carefully injected, not merely under the shell, but into the embryo itself. In this living culture, the virus develops rapidly and is kept free from contamination by other viruses or bacteria.

Another remarkable discovery is that passing virus from egg to egg over a period of time will change its character and destroy the power of the virus to produce disease. This discovery has made possible the production of antibodies, the mysterious organisms provided by nature to fight diseases. These antibodies are used in vaccines, along with killed or weakened virus, in treatments to make persons immune to a disease.

Dr. Joseph Stokes of Philadelphia has used egg-developed virus to inoculate children against measles, with excellent results.

Russian scientists experimented in 1940 with inhalations of vaporized anti-influenza serum during a flu epidemic, and this idea has been further developed by American scientists. The U. S. Navy, using a specially built tank, has experimented with mass inhalations of serum vapor.

Numerous strains of virus cause influenza. One of them, known as Influenza A, has been isolated by Dr. F. B. Burnet of Australia. Tests with Influenza B on "human guinea pigs," reported last year by Dr. Thomas Francis, Jr., of the University of Michigan School of Public Health, indicated that a single kind of flu may attack the same person twice within four months. Inhalation has yielded more favorable results than any other method of flu prevention tried thus far.

Thanks to the research of Drs. Seeds and Mazer of Texas, virus pneumonia now can be diagnosed with X rays. An X-ray pat-

Light shining through the healthy egg below reveals treelike structure



... but here's an egg simply teeming with virus. Passing virus from egg to egg produces disease-fighting antibodies.



tern of the disease has been identified. Some success also has been achieved in X-ray treatment of virus pneumonia.

The history of smallpox, one of the virus diseases, suggests what may be accomplished when more is known about these micro-organisms. Smallpox is believed to have existed in China in 1700 B. C., and by 1000 A. D. it had spread all over Europe. Before the great Dr. Jenner developed smallpox vaccine, more than 200,000 persons a year died in Europe of this disease. But since then smallpox has steadily declined and is rare now in civilized countries where vaccination is routine health procedure.

In one week recently, 32,000,000 Americans were estimated to have contracted colds. The Los Angeles Health Department says that 800,000,000 man-days of labor are lost annually in this country because of colds. In Detroit, during one week of the all-out war effort, flu kept 15 percent of the workers away from their jobs. But colds and flu are only a couple of the many ways in which the filterable viruses, which science may now be on the verge of conquering, have sabotaged humanity.

What's Good for a Cold? Here Are 10 "Musts"

- 1 Avoid crowds. Viruses are spread by coughing, sneezing, and just breathing.
- 2 When you catch cold, stay home. If possible, go to bed. Rest saves strength.
- 3 Be sure to drink lots of water, hot liquids, and fruit juice.
- 4 Avoid close contact with others. Nothing spreads faster than a cold.
- 5 Always cover your nose and mouth when you cough or sneeze. Germs scatter.
- 6 Eat nourishing food—not too much at a time, but often.
- 7 Take a mild laxative only when necessary. Avoid strong cathartics.
- 8 Don't strain your eyes by reading. A cold weakens your eyes.
- 9 Call a doctor if your cold is very severe, or if you have pain in the ear or chest.
- 10 Stay in bed until your temperature is normal. Stay at home until you are well.



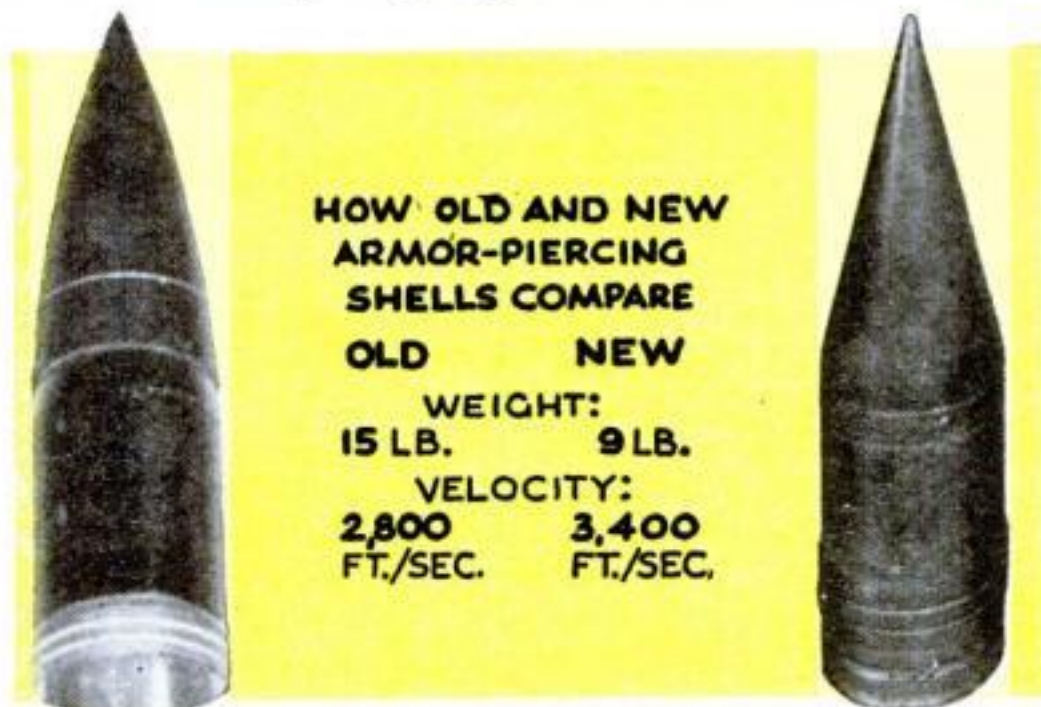
SPRAY ARMOR protects this Coast Guard fireboat and crew from flying sparks, and enables the vessel to attack harbor fires at close range. This newest seagoing fire-fighting apparatus is 40 feet long and as powerful as three fire engines. It was built for duty at Manila and other recaptured Pacific ports.

CARBIDE ARMOR-PIERCING SHELL.

A separate, bullet-shaped core of cemented tungsten carbide, hardest metal made by man, is housed in an aluminum casing and hits with such striking force that it rips through a tank's armor plate at ranges up to 3,000 yards. This shell-within-a-shell (see the five principal parts at the lower

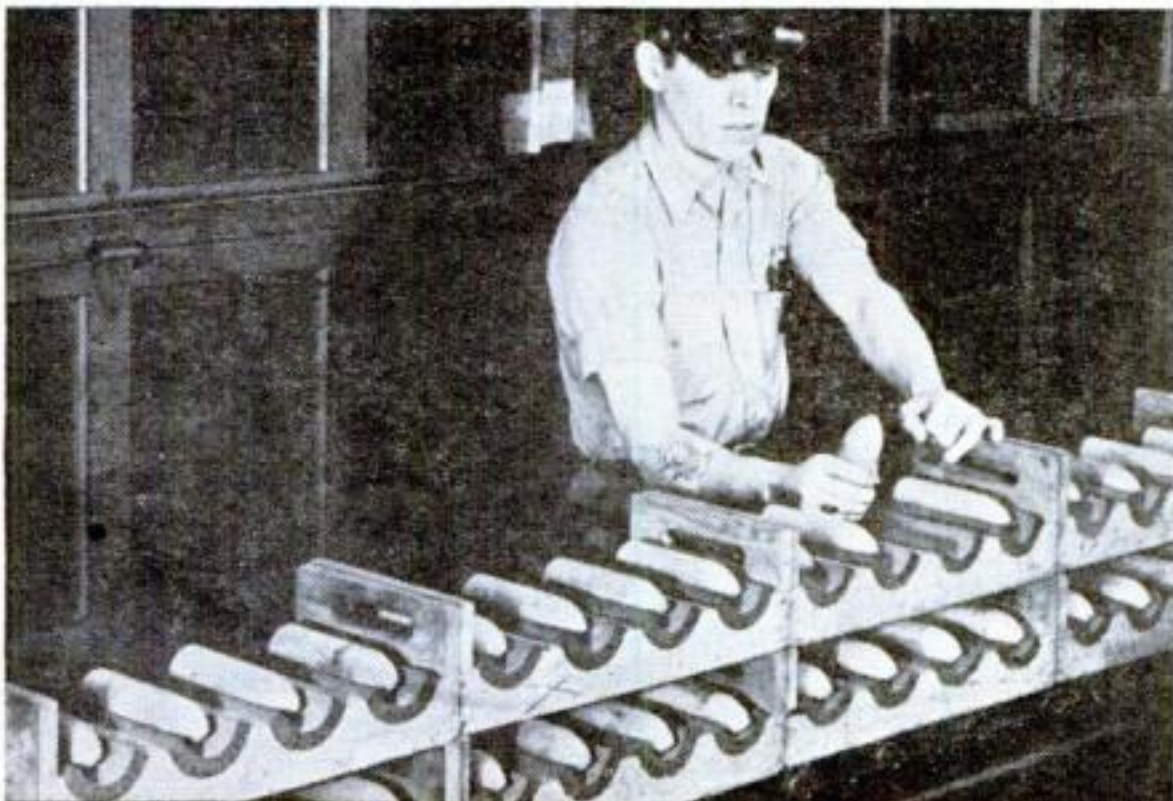
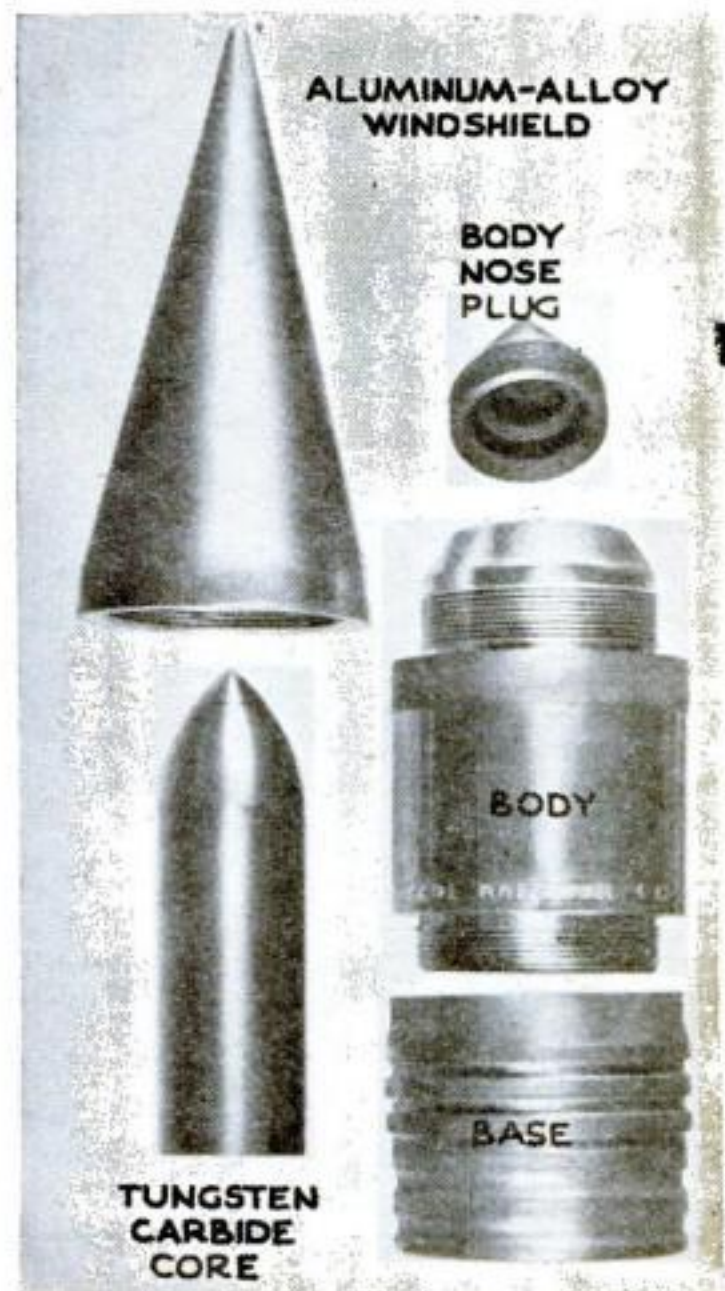
right) is made for tank and antitank guns.

The extreme hardness of the core prevents it from flattening on impact. Its aluminum covering streamlines the projectile and permits a small-diameter core to be fired from a gun of larger bore. After penetration, the carbide core breaks up and scatters fragments in all directions.



The hard and tough tungsten carbide core of this shell penetrates armor with far greater effectiveness than other steel-piercing projectiles. Made by the Carboly Company, these tank-busters have been in combat action for the past year.

RUBBER-SPONGE "BEDS" cradle the delicate carbide cores before they harden into the toughest of metals.



The Little Top That Aims a Gun

How the gyroscope, once just a curious scientific toy, has been harnessed to guide ships and planes and make their fire deadlier.

A TINY, fast-spinning wheel that used to be nothing but a child's toy has been transformed overnight into one of the deadliest of our war weapons. The gyroscope has finally come into its own, and we are making

full use of its uncanny power. It virtually saved the battleship from the junk pile by giving us gunsights that could knock down Jap planes before they got close enough to dive-bomb or launch torpedoes. It made the devastating B-29 raids on Japan possible without fighter escort. The Superfortresses can take care of themselves because of two spinning wheels no bigger than a baby's fist that give their guns accuracy never known before.

The turning point in the Pacific war came when U. S. "Battleship X" virtually annihilated a force of attacking Jap planes on October 26, 1942. That was the first major tryout of the new gunsights and the first clear-cut victory of seapower over airpower in many a day. When the reports of that battle came in, it was apparent that something new had been added since Jap planes sent the mighty British warships *Repulse* and *Prince of Wales* to the bottom in a few minutes. The Navy was so thrilled about the new gunsight and attached such importance to it that even the name of the battleship was kept a secret for a long time afterward. Now we know that it was the *South Dakota*, and the Navy has also revealed the fact that its ability to smash attacking planes was due to the gyroscopic sights newly installed on its anti-aircraft guns.

Many thousands of the gunsights have been made since then. They are now in control of practically all American and British naval anti-aircraft guns, and they have shot down Jap planes by the hundreds. That is one reason why our Navy was not afraid to go within range of Japanese land-based planes. The Jap navy was chopped down to near impotence by a succession of defeats. Some of these were administered by our surface ships and some by our planes, but in either case the superior protection of our fleets against attack from the air gave us a mighty advantage. Jap pilots knew it was literally suicide to attack our ships, but they kept trying. Very few lived to try again, although a few got through to inflict damage on light naval units.

American inventive genius has given us these important new weapons, and several

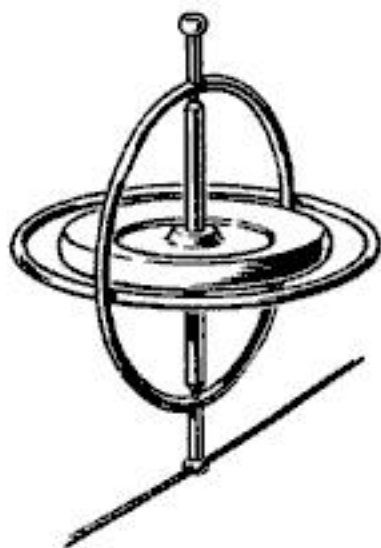
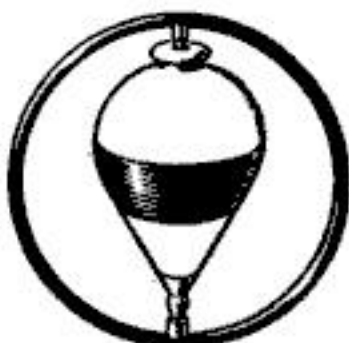
Drawings by STEWART ROUSE

WHAT IS A GYROSCOPE?



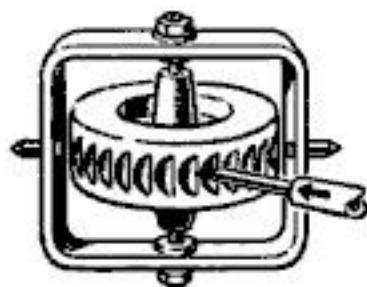
A spinning top is a simple gyroscope. Obeying the natural law of inertia, it always maintains its axis stationary in space.

Put that spinning top in a ring, with bearings at top and bottom, and you have the basis of a gyroscope.



In this familiar gyroscopic toy, a top has been given true balance. This plaything inspired Elmer Sperry's work.

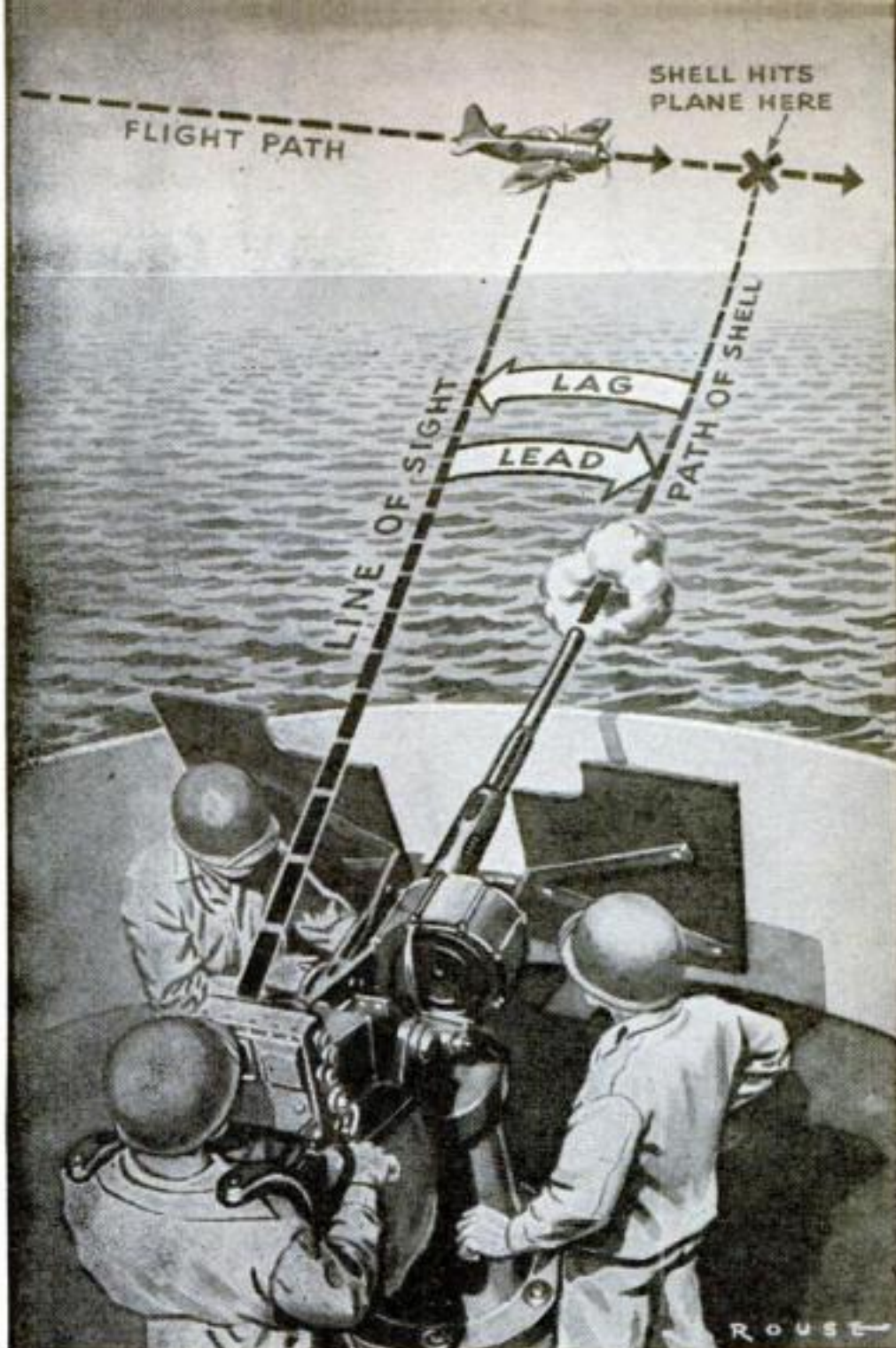
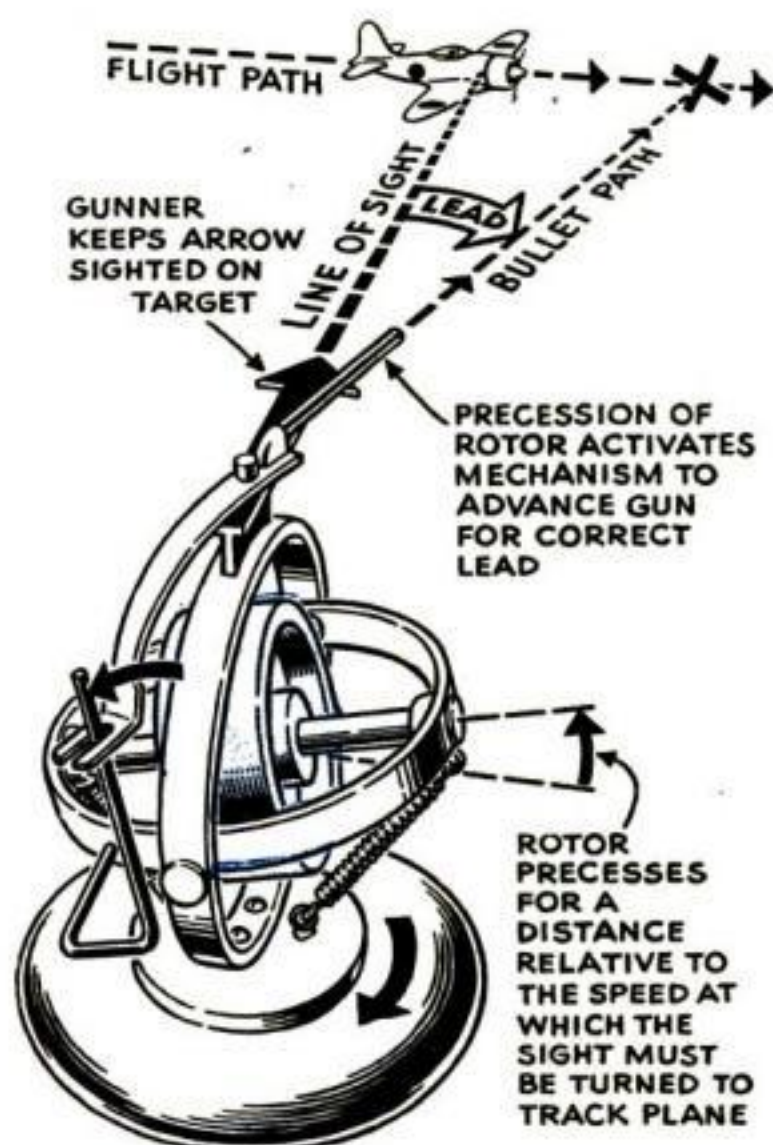
For practical use, continuous rotation is needed. The rotor can be part of an induction motor



... or it can be kept spinning by a jet of air drawn against its notched rim by a vacuum created inside the instrument.

"RATE GYRO" COMPUTES LEAD

for antiaircraft guns. Putting a brake on a gyroscope makes it a "rate gyro," so that the amount of its precession (tilt to resist turning) is determined by the rate at which it is moved from its original plane of rotation. In the model below, the arrow represents line of sight to the target; the rod, direction in which gun barrel is pointed and path of the bullet.



As the gunner follows the target with his sight, the precession of the gyro causes the gun barrel to "lead" the enemy plane. The faster the gun is swung, the greater the precession becomes and the more the barrel leads the sight, so that shell and plane reach the same point simultaneously.

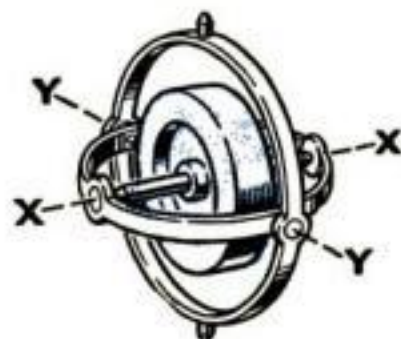
others, by harnessing the peculiar power that scientists have long known to reside in the spinning gyro wheel. The principle of the gyro is a simple one and as old as the world itself. The inertia of a spinning mass is what makes a top stand upright, and this

is the basis of all gyroscope uses. Though scientific men have known this for more than 100 years, they made no practical use of it until early in this century. Their first use was in a weapon of war, the torpedo, as a stabilizing agent. Then, in 1911, after

GIMBAL RINGS ALLOW ROTOR TO SWING FREELY

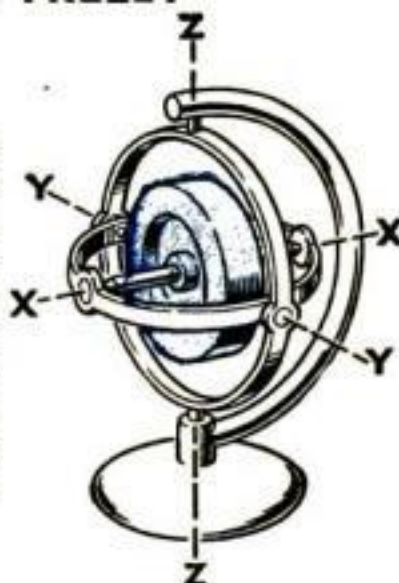


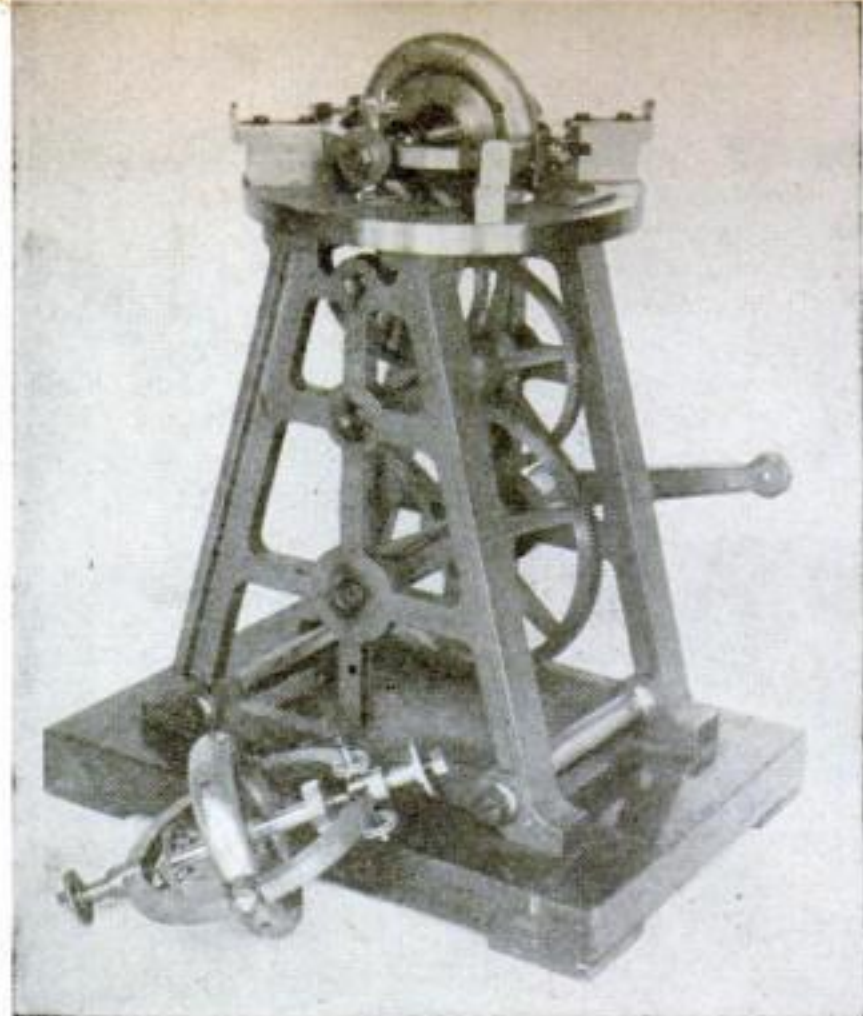
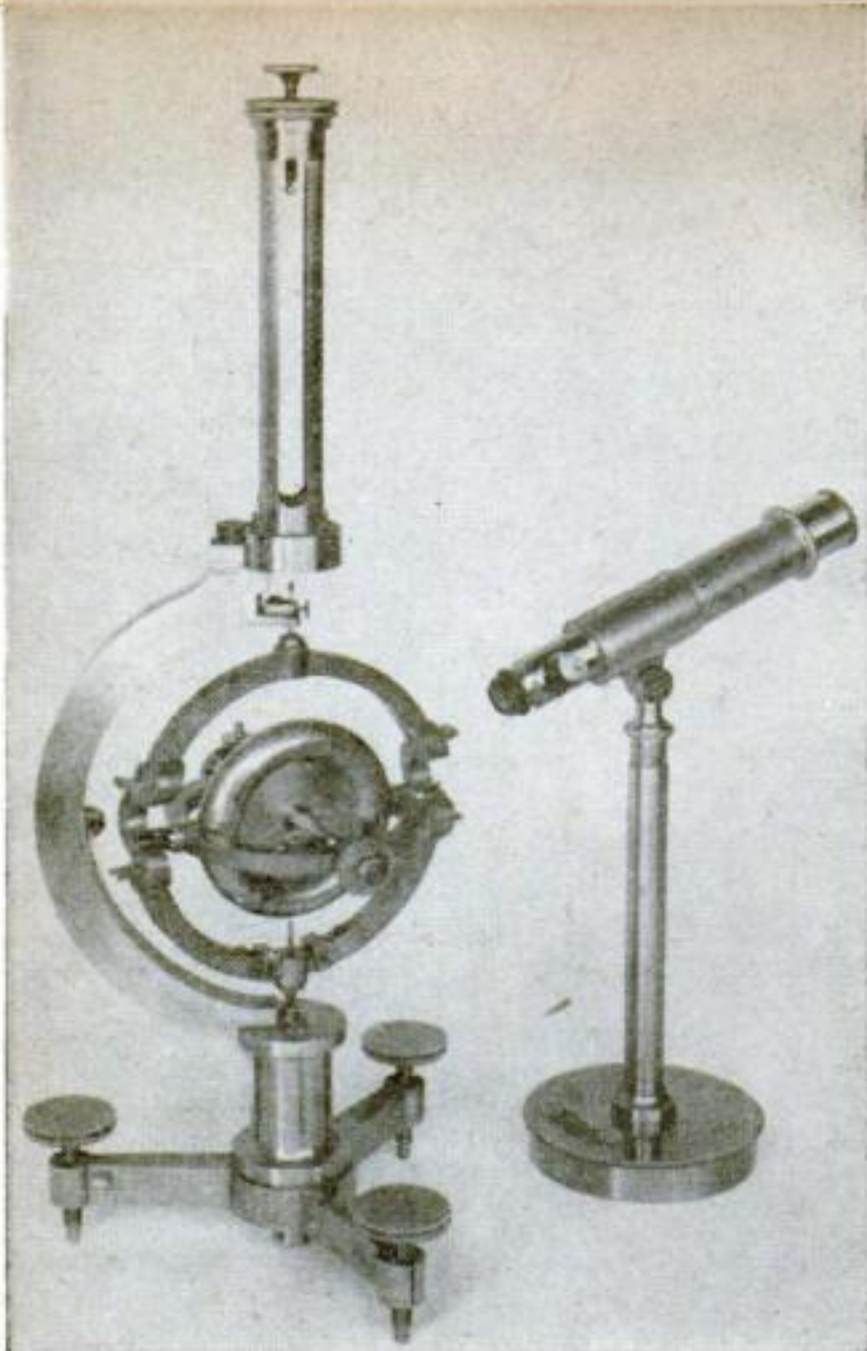
Starting with a well-balanced rotor, an inner ring is provided for its bearings. X-X is the spinning axis.



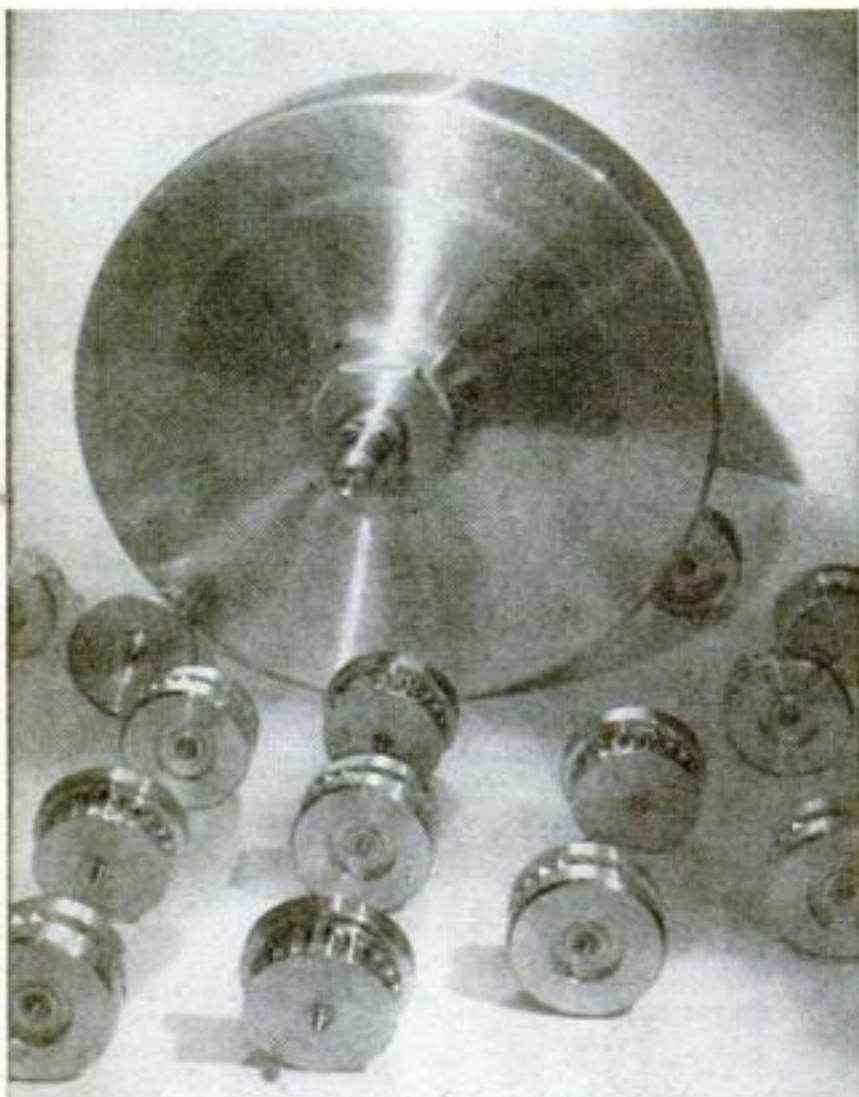
A second ring is attached by free-turning bearings. In it, the rotor can swing on axis Y-Y, at right angles to axis X-X.

Only a half ring is needed to complete the gimbal mounting. On this third axis, Z-Z, the inner rings turn, enabling rotor to swing in any direction. Ball bearings are used in all axes of the gimbal rings.





FIRST GYROSCOPE to be so called was the instrument built by Leon Foucault, French physicist, in 1852 to prove the rotation of the earth. For rotation, the rotor in its inner gimbal ring was placed on the stand above and cranked to high speed, then transferred to the mounting at left. This is a duplicate owned by Columbia University.



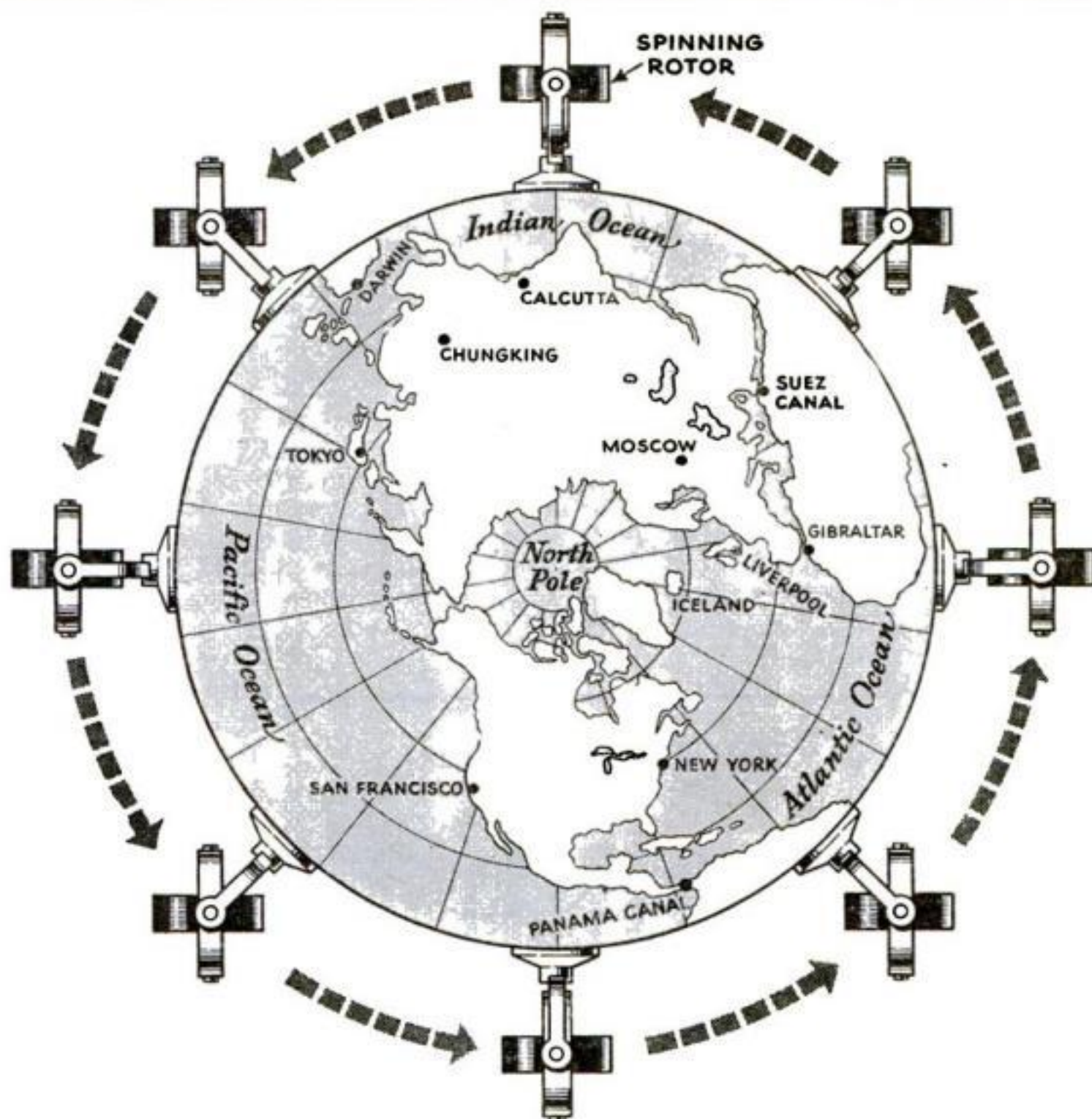
MODERN ROTORS. For practical uses, gyroscope rotors like these are made by the thousands. The smaller ones are of the air-driven type—miniature turbines—employed in aircraft instruments, gunsights, etc. The large one is the 10-inch rotor of the Sperry gyrocompass made for big steamships.

years of labor and discouragement, Elmer Sperry was given a chance by the U. S. Navy to prove that a gyrocompass was a better and more reliable navigating guide than the time-honored magnetic compass. The Navy trials were a triumph for the inventor.

That was the beginning of man's mastery of another natural law. The gyrocompass, of course, is now in use on just about every first-class ship in the world. After that, Sperry went on to invent the stabilizer that takes most of the roll out of ocean-going steamers. Then he put his gyrocompass to work as an automatic ship's pilot. For airplanes he produced the gyro horizon, direction indicator, and other gyroscopic instruments that first made blind flying possible. Harnessing these instruments still more, he made the automatic gyro pilot for planes, now in universal use.

In the First World War, these were the only instruments based on the gyroscopic principle. In this war, the gyroscope rates as one of the most important of all agencies for giving precision and stability to weapons as well as safety to navigators on the sea and in the air. It was the U. S. Navy that gave Elmer Sperry recognition for his years of work on the gyroscope when, in 1911, his gyrocompass was installed in the then new battleship *Delaware*. And it was Sperry's company that came to the Navy's rescue at a critical period of its history by developing

GYRO'S STABILITY IS UNAFFECTED BY EARTH'S ROTATION

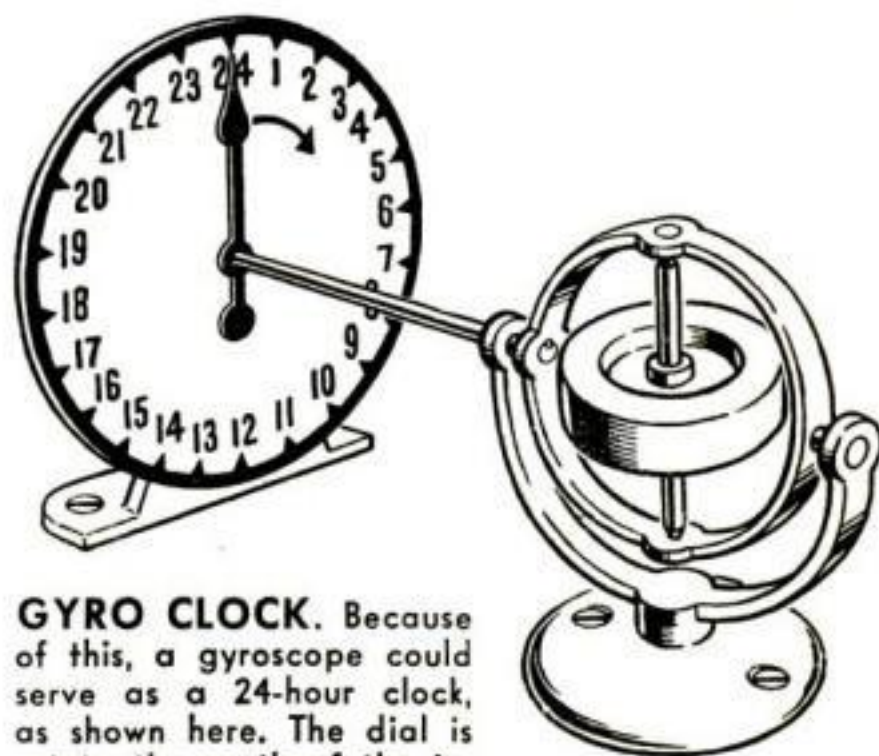


A spinning gyro wheel maintains its original spinning plane regardless of the rotation of the earth. To an observer, it appears to make one complete revolution about its horizontal axis in 24 hours. Actually, it has stayed in the same plane while the earth has turned around.

and building the gyroscopic gunsight. The importance of this one invention to the nation can hardly be exaggerated.

Fortunately for this country—and for the whole civilized world—the Sperry Gyroscope Company was laboring over a gyroscopic gunsight even before the Japs descended upon Pearl Harbor. In 1940, Sperry engineers, in collaboration with Dr. C. Stark Draper, of Massachusetts Institute of Technology, went to work on a Sperry project of applying a “rate gyro” to a computing gunsight for warships. It was highly desirable to create a naval sight based on the gyroscope because of its ability to maintain its position in space in spite of a ship’s roll and pitch. Mechanical computers had no such ability.

The “prescription” for the sight was finally written. The precision demanded in all



GYRO CLOCK. Because of this, a gyroscope could serve as a 24-hour clock, as shown here. The dial is set to the south of the instrument, with the hand attached to an extension of the gyro’s horizontal axis. If friction could be overcome, it would be a perfect sidereal clock.

parts was far more exacting than that of the finest watch. Tolerance of some elements had to be as small as one ten-thousandth of an inch to make the gunsight accurate. Months of diligent effort under high pressure brought success. Engineering brains and ingenuity had written another brilliant chapter in the history of American invention.

Almost ridiculously small are the vital parts that give this gunsight its ability to shoot speeding planes out of the air with regularity. The rotors—two to each sight—are two inches in diameter and weigh less than a pound each. They are turned by an air jet shot into slots around the perimeter. At a speed of 10,000 to 11,000 r.p.m., they have the necessary inertia to remain independent of all influences except those deliberately and carefully brought to bear upon them in order to perform the function of

giving the gun a correct lead in front of the moving target.

When a spinning wheel, nicely balanced, is properly hung in gimbal rings, it is entirely independent of all its surroundings—as if it were a thing apart from the earth. Its own inertia is its only law, but that law is absolute. All gyroscopic instruments obtain their peculiar abilities from calculated efforts to make the spinning rotor violate this law, a thing the scientists know it will not do. What the gyro does to preserve its inertia is to “precess,” that is, to move at a 90-degree angle away from a force applied against its axis of rotation. Since this movement can be counted upon absolutely, the inventors employ it to do whatever is desired—to open and close valves, apply and cut off electric current, and so forth.

The type of instrument employed in the gunsight is called a “rate gyro.” That is,

it is a gyro controlled by springs so that the faster it is made to precess, the greater the force it exerts on the springs. In the gunsight, this force is determined by the rate of movement given by the gunner to the gun in following the target. Fast movement gives greater force than slow movement. This force is instantly transmitted to a mechanism that offsets the line of sight from the line of the gun bore so that when the gunner is aiming his sight at the target, the gun is actually pointing ahead of the target by the right amount so that the enemy will fly into the bursting shell. All the gunner has to do is to follow the target steadily with the sight and pull the trigger.

When the B-29's were being designed for the special mission of long-range bombing raids on Japan, it was obvious that they would have to go without fighter escort, so the efficiency of their guns in protecting them from enemy fighters was a matter of greatest concern. Gen-

WHAT IS “PRECESSION?”



The rotor of this gyro is spinning in a vertical plane from front to back.



Try to push the rotor out of its spinning plane. Instead of tipping, it turns to side.

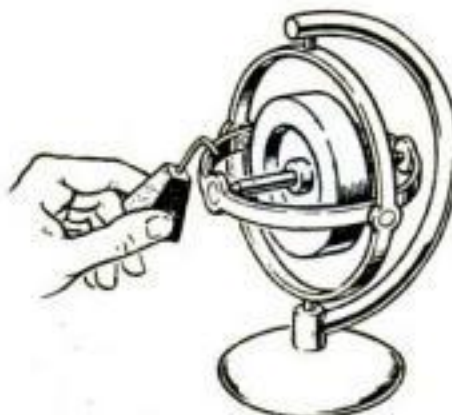


Pressure from the opposite side makes it turn the other way, on its vertical axis.



GRAVITY causes precession if the rotor is not balanced. The weight pulling against the spinning plane causes the gyro to turn as shown.

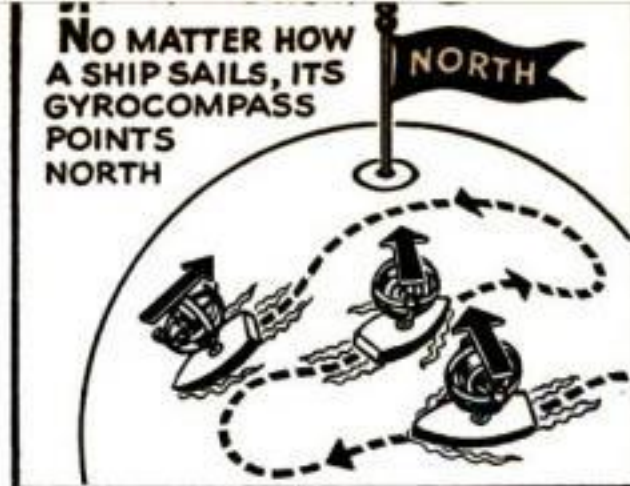
Try the same test with the rotor not spinning. Weight simply pulls the ring downward, as there is no resistance now. Any unbalance in a gyro causes precession.



A TO DEMONSTRATE, WE START WITH A GYROSCOPE AT THE EQUATOR, ITS SPIN AXIS POINTING EAST AND WEST

B AS GYRO IS CARRIED EASTWARD, LEVEL OF MERCURY CHANGES. WEST END BECOMES HEAVIER AND EXERTS DOWNWARD PULL ON SPINNING AXIS. GYRO PRECESSES TOWARD NORTH-SOUTH POSITION

NO MATTER HOW A SHIP SAILS, ITS GYROCOMPASS POINTS NORTH



C PRECESSION CONTINUES AS LONG AS MERCURY IS UNBALANCED. SPIN AXIS SEEKS NORTH-SOUTH DIRECTION

D WHEN SPIN AXIS POINTS NORTH AND SOUTH, MERCURY IS BALANCED IN TUBE. GRAVITY NO LONGER AFFECTS GYRO.

GYROCOMPASS DOES NOT POINT TO MAGNETIC POLE, BUT ALONG A NORTH-SOUTH MERIDIAN

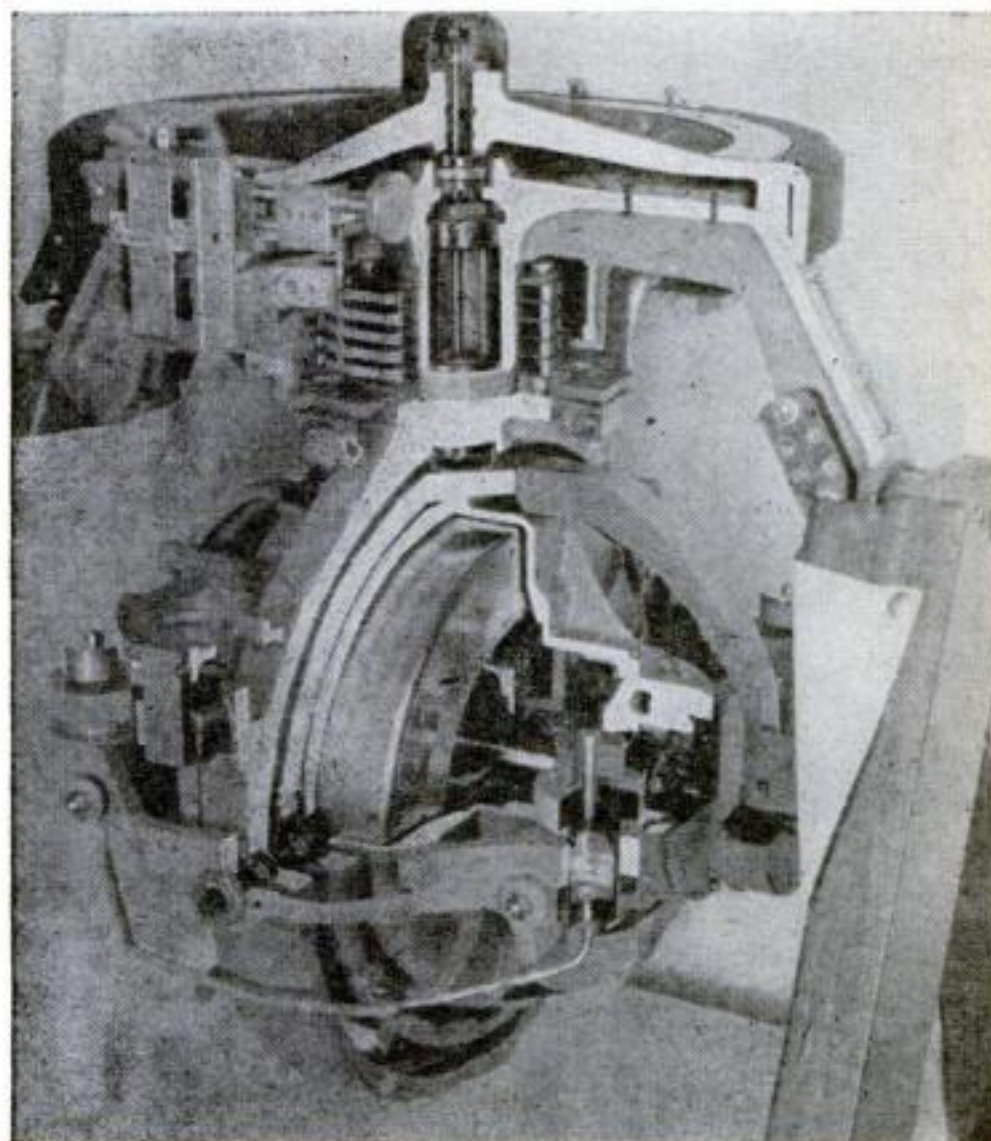
HOW THE GYROCOMPASS OPERATES.

By attaching a mercury tube to the gyroscope, the force of gravity is brought to bear on it. The rotor no longer holds the same plane, but precesses to keep its spinning axis pointing north and south.

ROSE

SPERRY GYROCOMPASS uses a 10-inch, 55-pound rotor, seen in lower part of cutaway view at right. A slender tube extending around the rotor holds 12 ounces of mercury. Such instruments are now used on most big vessels, including warships.

AN EARLY EXPERIMENT. The familiar gyro toy is used by Elmer Sperry in the old photo below to show how he applied outside forces to make it a compass.



eral Electric was given the vitally important task of designing the controls for these guns. The central gunnery system invented for this special purpose is a combination of electronic, mechanical, and gyroscopic devices that has spelled disaster for the Japs. (P.S.M., Feb. '45, p. 88.) Here again, the prodigious task of computing the speed of an attacking plane relative to that of the bomber was turned over to two tiny spinning rotors, electrically driven in this case. It makes no difference to these magical wheels whether the speed of the fighter must be added to or subtracted from that of the Superfortress; it is done instantly. The gunner sits in a warm, pressurized cabin, follows the target with his sight, and pulls the trigger that may fire one, two, or three sets of guns at once. All calculations are automatic and instantaneous. The guns lead the target by the correct angle at all times.

These are the defensive uses of the gyroscope in war—important enough, surely, but only a fraction of the gyro's contribution to winning this war. Gyros are on the offensive, too—in planes, tanks, ships, submarines, and torpedoes.

When the big bombers—the B-29's and all the lesser ones—arrive over their target area, the whole ship is turned over to the gyroscopes that make the automatic pilot

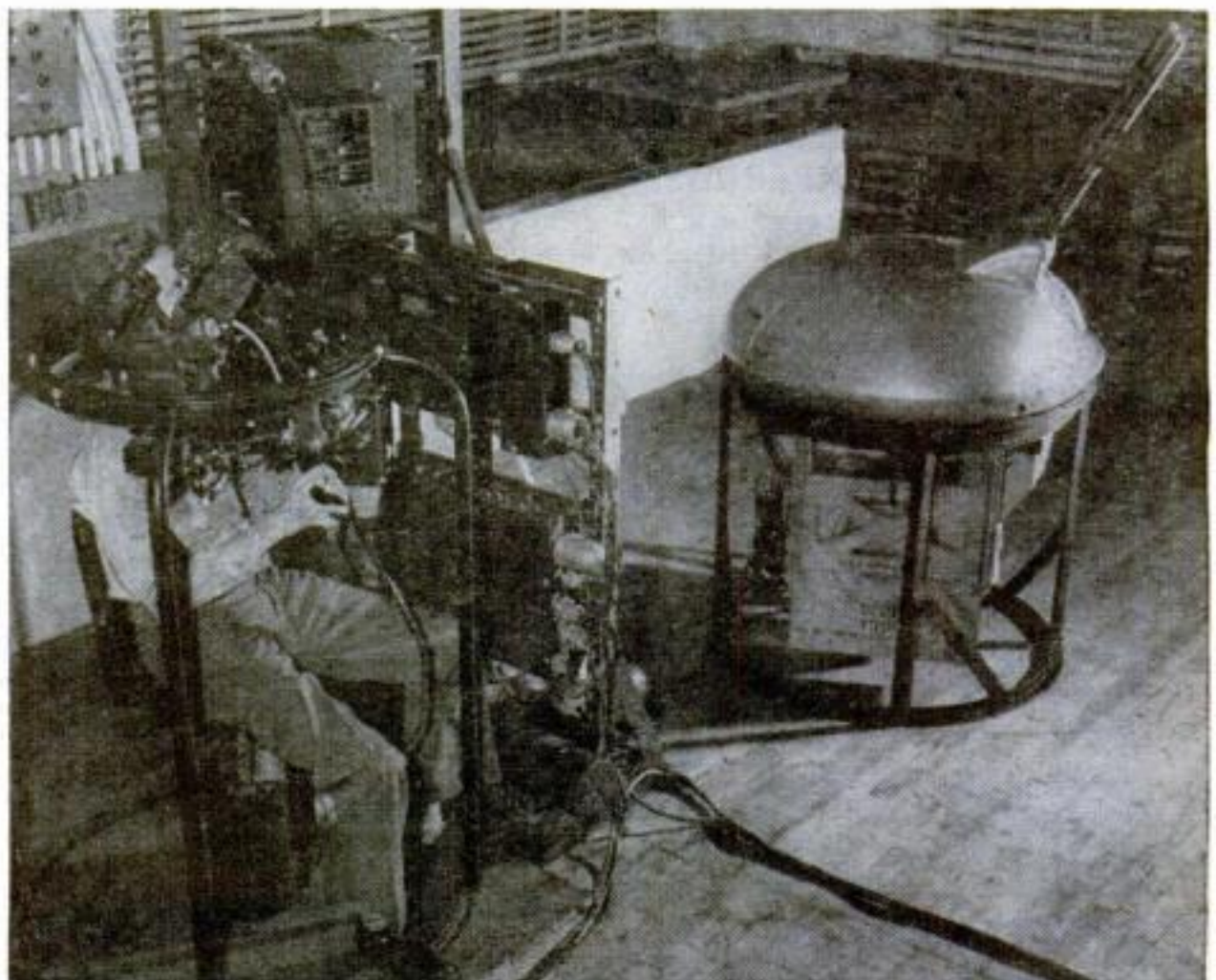
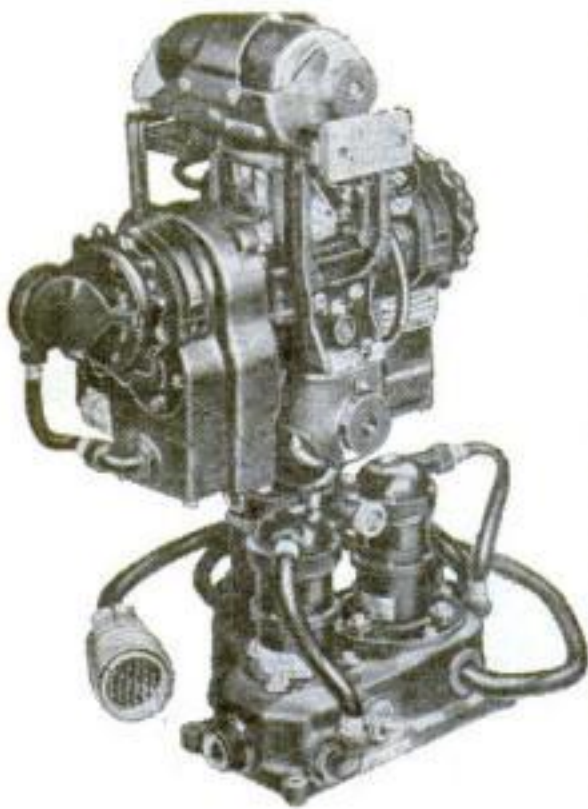
work. The bombing runs must be straight and true, and this is managed by the spinning wheels more accurately than any human hand could do it.

And now the bombing run is on; the vital moment has arrived for which the great machine and its crew have made the perilous journey. Again the gyroscope is called upon to make the bomb hit the mark. The Norden bombsight is put to work—and two more of the spinning wheels are doing their stuff as essential parts of that famous weapon. (P.S.M., June '45, p. 70.)

There has been a lot of controversy about the relative potency of our tanks as against those of the enemy, but in one respect there is no question of our superiority in this department: our tanks can shoot straight on the run. Here, again, the secret is the gyroscope—just one 14-ounce rotor that holds the biggest tank gun on a true horizontal line, no matter how much the tank pitches and rolls over rough terrain. This was an achievement of Westinghouse (P.S.M., Sept. '44, p. 82). General Patton, who ought to know about tanks, gave high praise to the gyro stabilizer in telling how he had been able to beat the larger German tanks for sensational victories. The Germans could shoot straight only when they stopped dead, and then they were sitting ducks for targets,

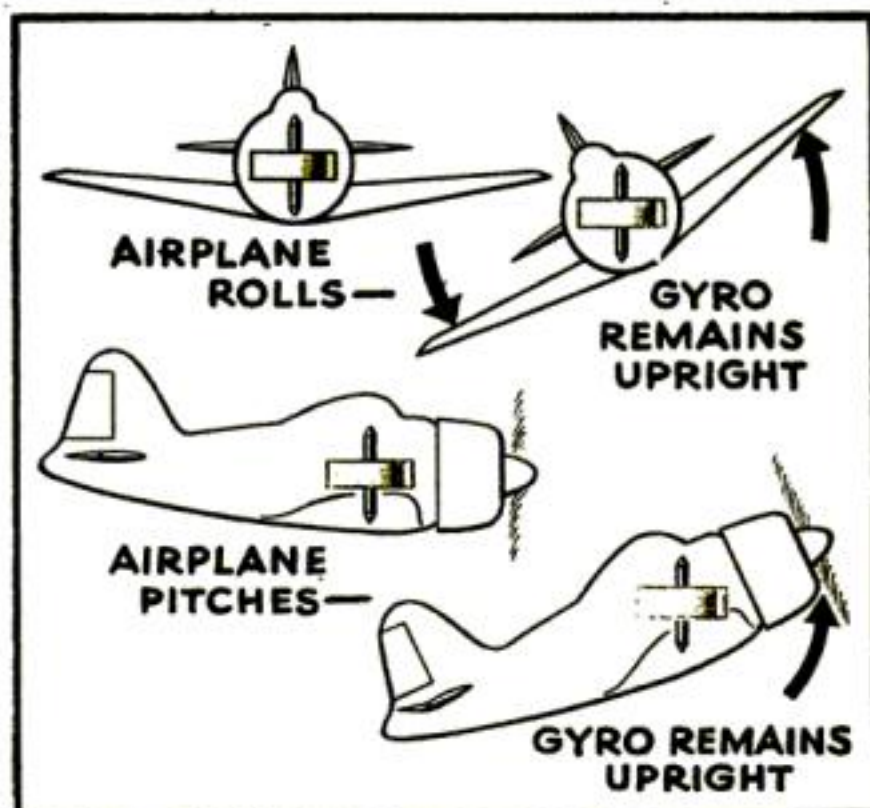
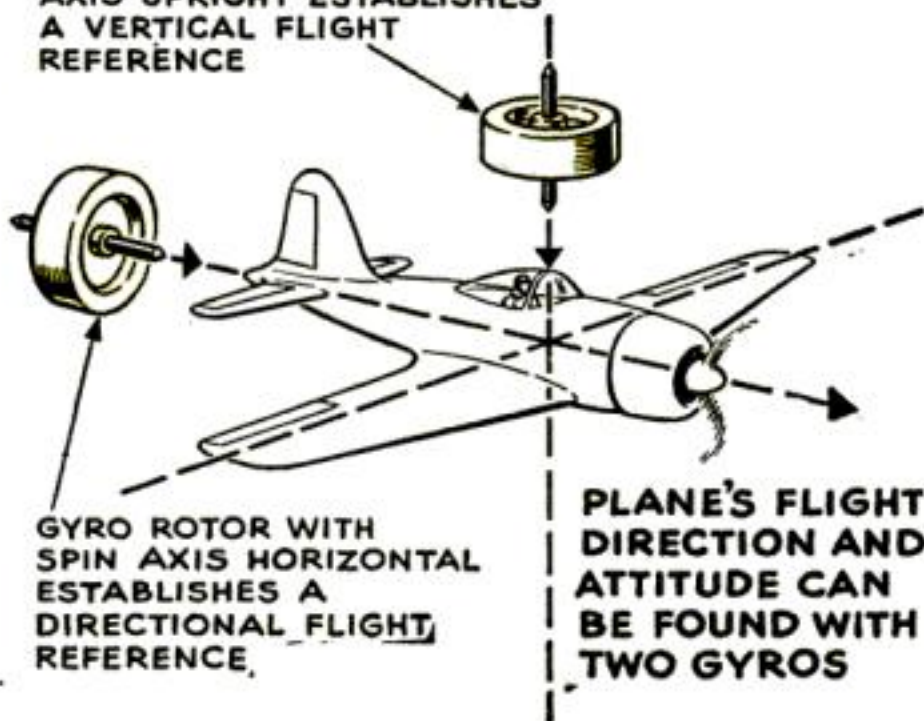
THE GYRO IS THE BRAIN OF THE SUPERFORTRESS' GUNS

At the left, below, is the central control gunsight that aims the guns of one to three turrets of the B-29 Boeing Superfortress. With its combination of gyroscopic, electronic, and mechanical devices it automatically computes lead angle, gravity, windage, and parallax in a split second. All the gunner has to do is hold his sight on an enemy plane and pull the trigger. At right, separate units removed from the plane show a gunner using the sight while a turret obeys electrical impulses carried by a cable.



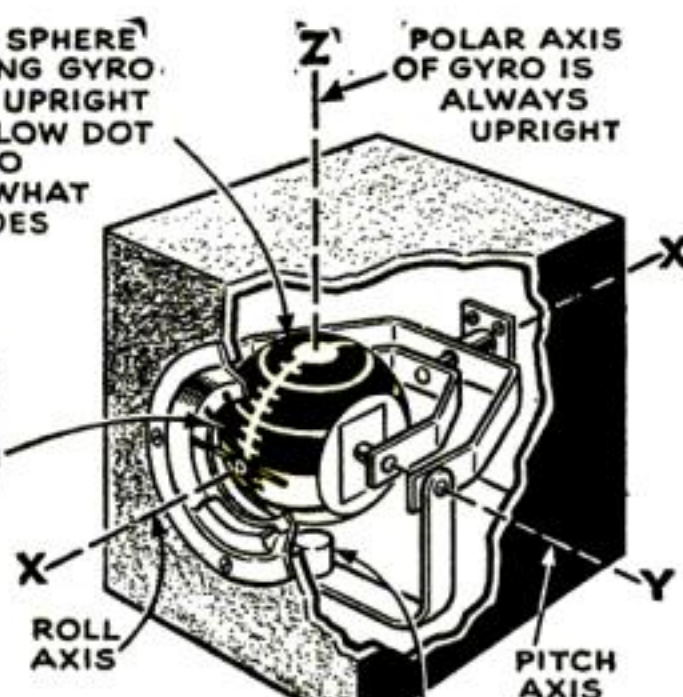
GYRO'S STABILITY IS USED IN AVIATION INSTRUMENTS

GYRO ROTOR WITH SPIN AXIS UPRIGHT ESTABLISHES A VERTICAL FLIGHT REFERENCE

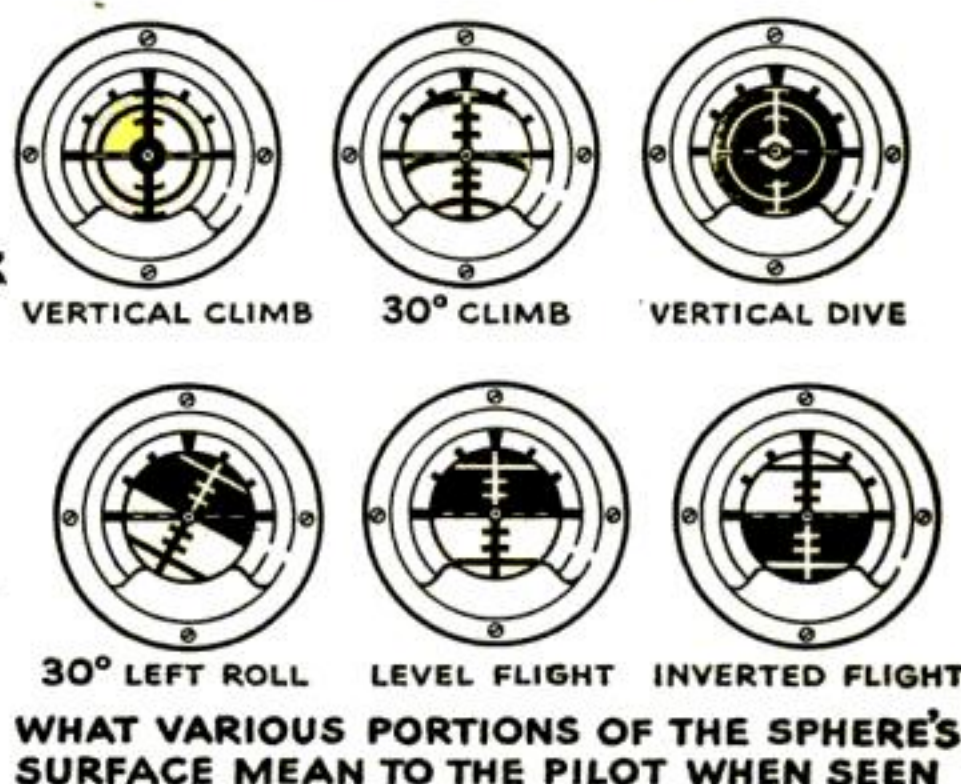


HOLLOW SPHERE CONTAINING GYRO REMAINS UPRIGHT WITH YELLOW DOT ON TOP, NO MATTER WHAT PLANE DOES

PILOT WATCHES SPHERE'S SURFACE THROUGH WINDOW



ELECTROMAGNET PULLS ON PIECE OF IRON IN BOTTOM OF SPHERE TO ERECT GYRO PERFECTLY



ATTITUDE GYRO SHOWS PLANE'S RELATION TO THE EARTH

while our tanks kept on the move, firing with deadly accuracy.

It should be kept in mind that a small gyroscope, such as those in planes, gun-sights, and gun stabilizers, has no great power. A man can move one of these rotors out of its plane of rotation with his hand. What it does have is infallible accuracy when it is nicely balanced and freed from the element of friction to the degree made possible by precise manufacturing methods. The gyro in the tank, for instance, merely opens and closes magnetic valves, an operation that takes practically no power. It is just a matter of making electrical contacts. Oil pressure, kept up by an independent pump, does the work of pushing the gun breech up and down, counteracting every movement of the tank. The gyro tells it when to push and when to pull.

Let's not forget, either, that it is the same uncanny gyroscopic power that gives the biggest guns in our fighting ships a true vertical reference at all times so they can fire with accuracy regardless of roll and pitch. This is certainly an offensive use of utmost importance. So is the work of gyros that guide our torpedoes to send Jap ships to the bottom. The gyroscopes in torpedoes did us plenty of damage in the Atlantic, but in the Pacific they have been largely on our side.

And these are not the only important uses we are making of gyroscopes to speed this war to a conclusion. Now that our scientists have really tackled the problem of harnessing the gyroscope to man's purposes, there is no telling what important new services they may find for it in the years to come.

—GOLD V. SANDERS.

A dime is its landing field:

JEEP WITH WINGS

By DEVON FRANCIS

ABOVE the treeless volcanic isles at Japan's back door, a new kind of war has been fought with a weapon more than 40 years old. The unarmed airplane, introduced at the start of World War I, returned to service to help drive the Japs into their inner citadel.

In the fighting that marked the start of the Kaiser's war, the flimsy aircraft of the period were used solely for reconnaissance. In the mobile, seaborne fighting of the Mikado's war, the role of the plane that drops no bombs and shoots no bullets became that of an airborne scout car, ambulance, motorcycle, and artillery observation post.

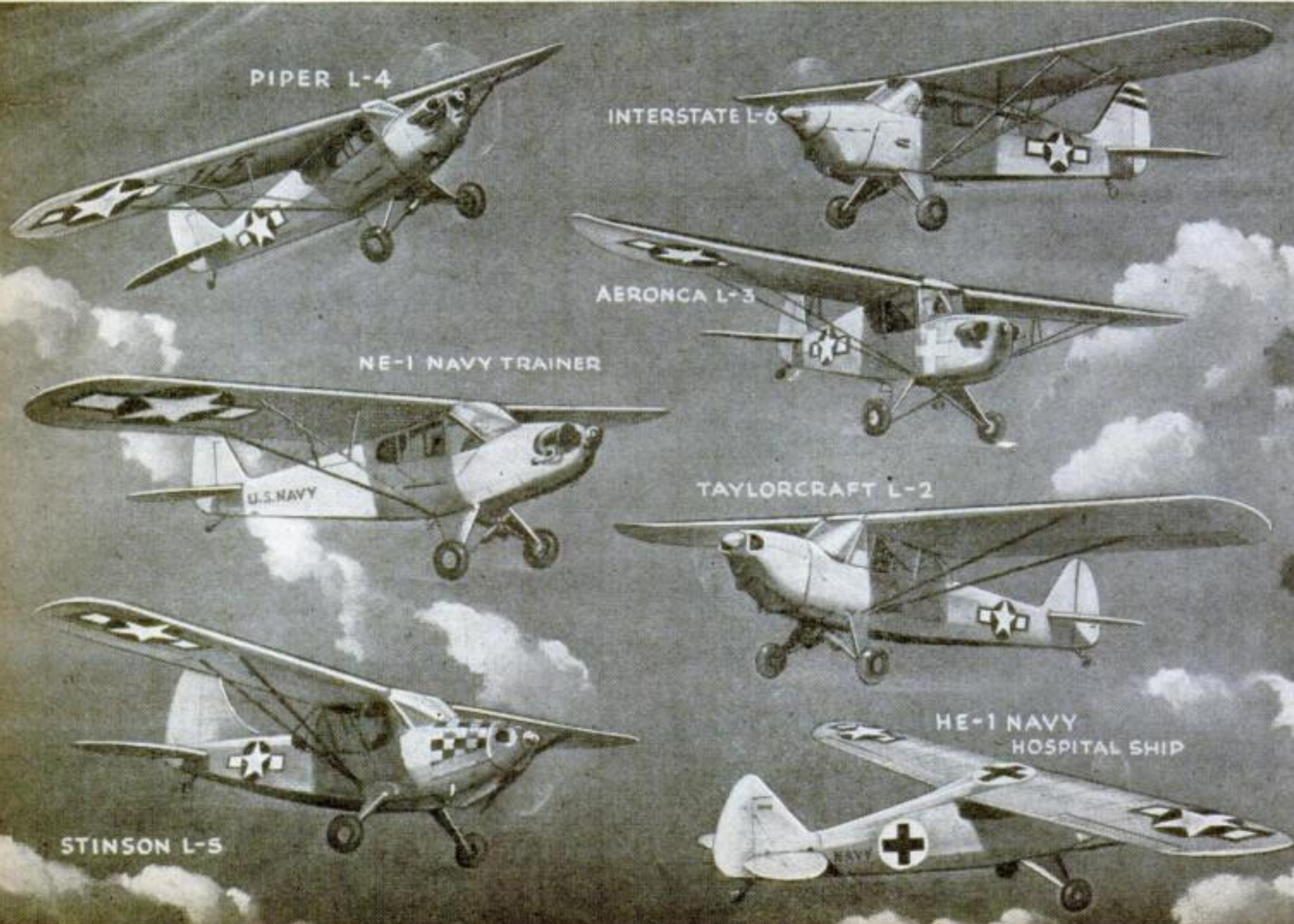
Of all the weapons that have been given wings for fighting in a third dimension, the "grasshopper" plane, often fitted with an engine of less power than that of a small automobile, is the most versatile. Grasshoppers have been used for almost everything that requires transportation, even including the laying of telephone wire to advanced observation posts over mountains.

Because they are slow and fly at treetop level, and therefore make poor targets for either ground gunners or enemy fighter pilots, they are ideal vehicles for carrying messages, directing highway traffic, and dropping supplies to units cut off by the swift ebb and flow of battle.

The grasshoppers are the same thing as the small private planes that used to dot the grassy, postage-stamp airports throughout the United States before the war. They have changed only their garb. Some of them have a little more horsepower. They carry two-way radio. A limited number, flying for the Army, the Navy, and the Marine Corps, are equipped with stretchers for ambulance work.

They require no regular landing fields. The first of them on Guam—and they were the first American planes to land there, as well as on Iwo Jima—sat down on a short strip of ground bucked flat by bulldozers. They can put their wheels on the ground and stop in less distance than the span of a Superfortress wing. A favorite trick of the grasshopper pilot facing an emergency is to land in a treetop. It damages the plane,

THESE ARE THE ARMY, NAVY, AND MARINE GRASSHOPPERS...





OKINAWA'S BATTERED CAPITAL is given the once-over by a Marine grasshopper. Scout plane flies low over flattened Naha, to seek out any signs of hidden Jap gun positions that may have survived.

but it's usually safe enough for the pilot.

With more affection than derision, the grasshopper has been called a flying egg beater, aeropoop, coffee grinder, and Maytag Messerschmitt. It might well be called an

AND THEY DO THESE JOBS



FLYING TIGER CUB? The shark-nose paint job on this lightplane doesn't fool anybody. But the cubs are tough; their losses have been slight.

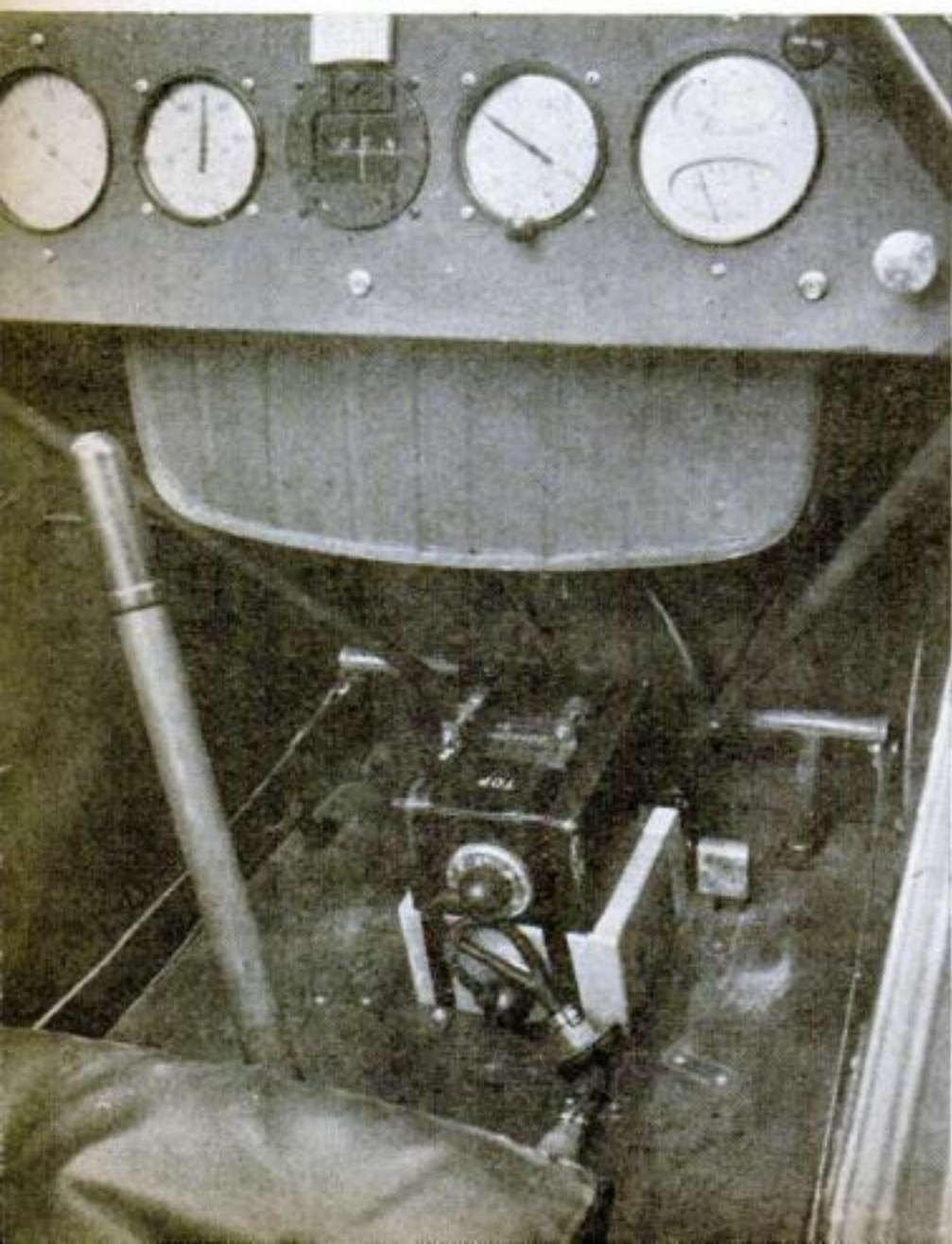
IN THE ARCTIC, the midgets don ski runners for landings on snow or ice. They are adaptable to any conditions, dependable, and economical.





GENERAL EISENHOWER often used his grasshopper to shuttle between headquarters and the front lines in the African campaign and on the Continent. Other commanders also used them. The airjeeps take off in 500 feet in still air. For landings, they sit down almost anywhere and stop in less than 200 feet.

EASY TO FLY. A grasshopper pilot has few instruments to watch. Originally designed for amateur civilian flyers, these planes use simple controls.



airjeep—aerial partner of the quarter-ton.

Airjeeps are at their best in artillery-spotting work. Flying at 25 to 100 feet above the ground, the pilot and his observer—they carry a crew of only two—can see everything on the ground.

During the invasion of Peleliu Island, in the Palau group, airjeeps were flown off carriers to direct Marine artillery fire. They hovered over the Jap positions and radioed ranges to the guns. During the shelling they retired to an altitude of 1,000 feet to avoid concussion. Then they swooped down to report the results.

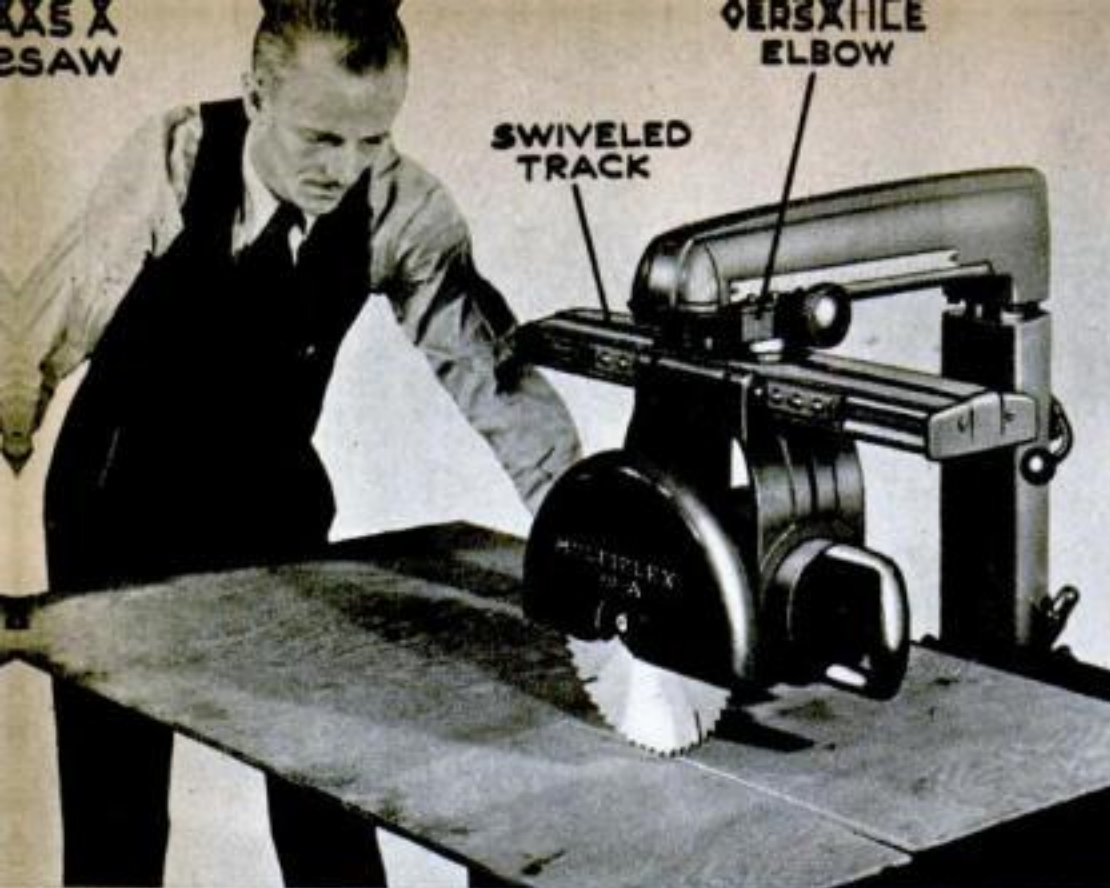
They topped off their performance at this Jap outpost by directing the fire that destroyed a flotilla of enemy barges loaded with soldiers sent to reinforce the garrison holed up in Bloody Nose Ridge.

The first Marine airjeep outfit organized as a squadron (*Continued on page 210*)

*Your
Pin Up-*

C-54 SKYMASTER, built by Douglas, is an all-metal adaptation of the DC-4 commercial airliner. The four 1,350-hp. engines can speed its maximum weight of 30 tons 3,000 miles at 275 m.p.h.



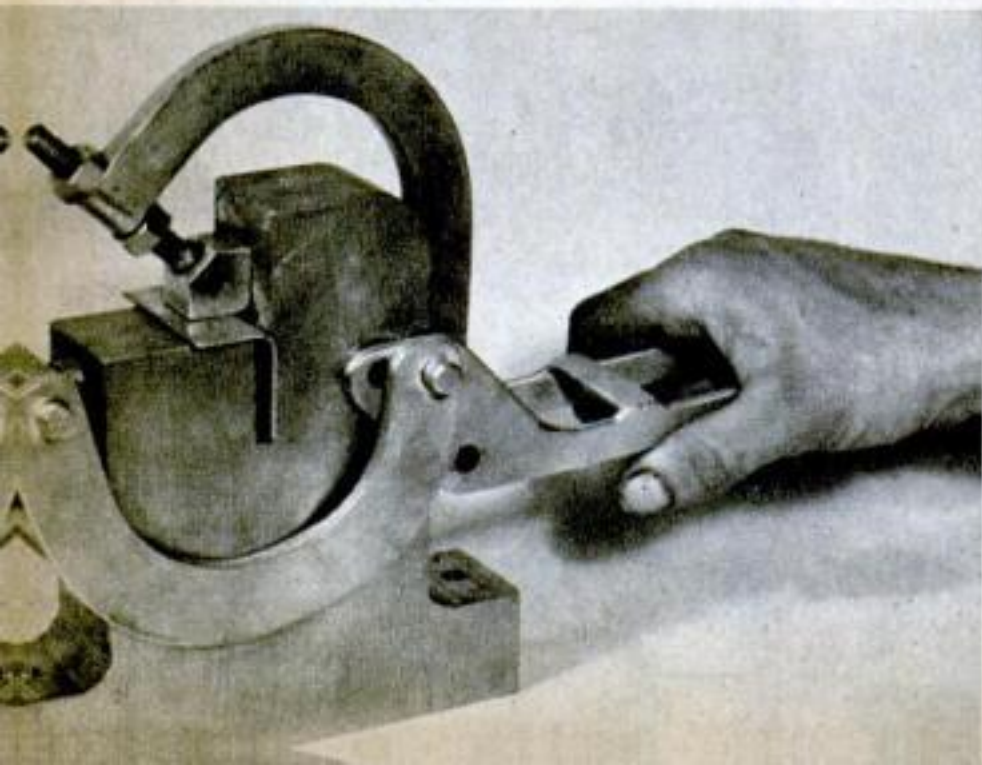


RADIAL-ARM SAW with a versatile elbow pivots right or left, and the arm mounting moves backward and forward in the rigid overarm. Special equipment converts the unit into a high-speed drill press. Made by Red Star Products, Inc., of Cleveland, the saw cuts miters of any degree, and the drill can be set for vertical, horizontal, or angular driving.



A NEW HOLDER for welding electrodes, designed to allow unobstructed visibility and maximum accessibility for deep-pocket work, requires only $\frac{1}{2}$ inch of rod for a tight, efficient current contact in the holder jaw. The design permits use of two to four inches of rod wasted in other holders. "Shortstub" is made by Hollup Corp., Chicago.

DUAL ACTION of the toggle clamp below makes easier any drilling or assembly work on angular parts. It was designed for Consolidated Vultee by W. G. Bowlus, Ft. Worth, Tex. Photo shows clamp pad and handle in "down" position.



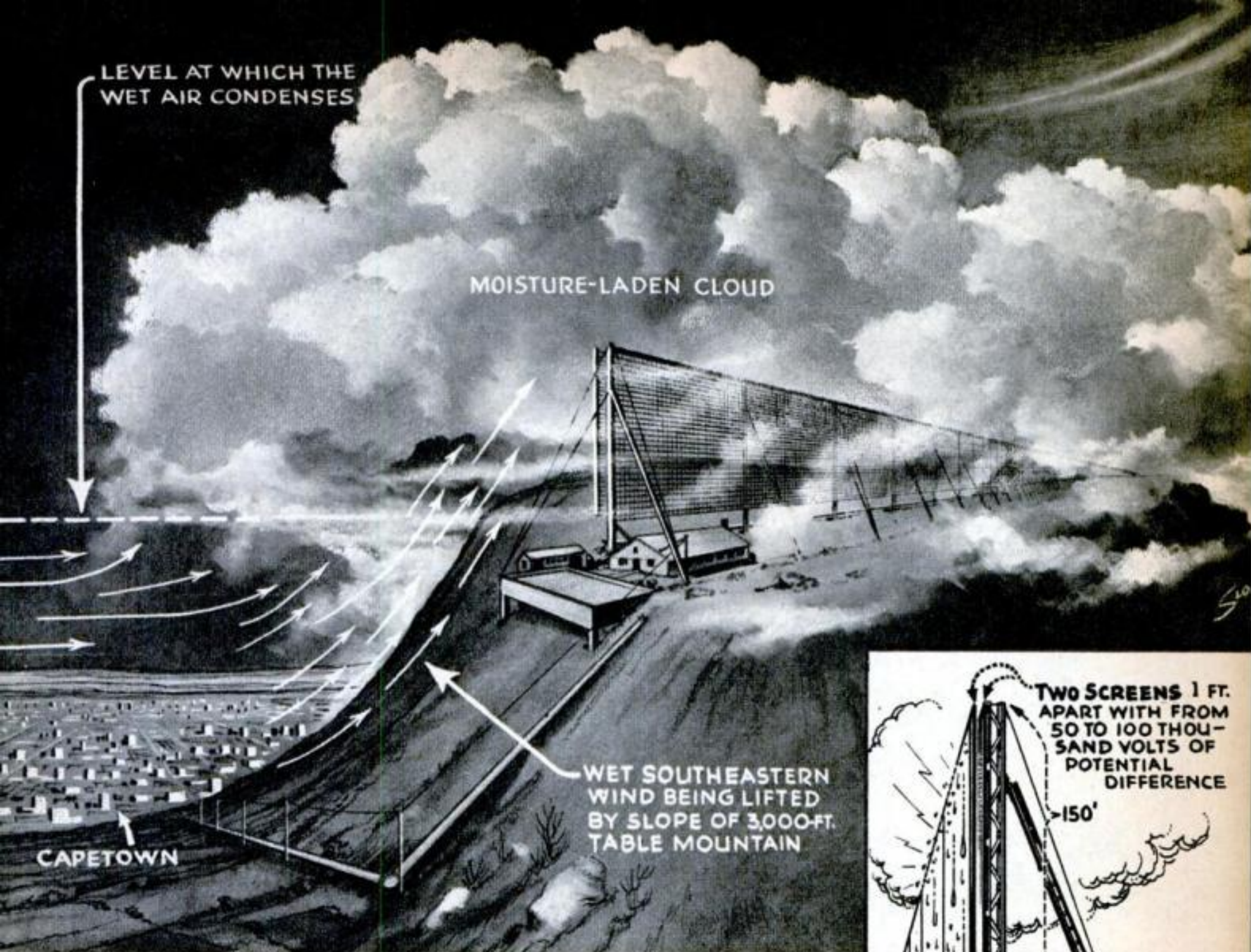
UNLOCKED: PLIERS OR WRENCH



LOCKED: HAND VISE OR CLAMP



SWIVEL JAW of this combination pliers-wrench insures a full grip by the entire jaw length on a flat or irregularly shaped object. Locked, the tool becomes a hand vise. It is put out by Seymour Smith & Son, Inc., Oakville, Conn.



Squeezing Water Out of a Cloud

CONDENSER WOULD PROVIDE CAPETOWN'S WATER

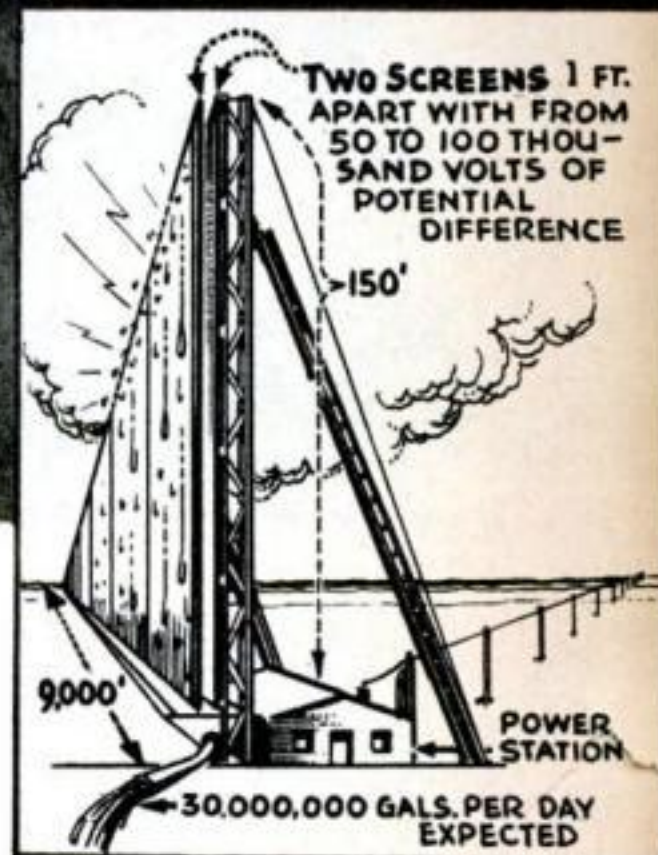
AN average of 3,000,000 gallons of water a day may be extracted by means of electricity from the most famous cloud in the world—"The Cloth," which covers Table Mountain on the southern fringe of Cape-town, South Africa. This would supplement the city's water supply in the dry season.

To capture this supply, Chief Meteorologist Theodor E. W. Schumann, South Africa's leading scientist, proposes the erection atop the 3,500-foot-high mountain of two parallel fences of wire netting, one grounded and one insulated, with a potential difference between them of 50,000 to 100,000 volts. These wire screens—about 150 feet high and 9,000 feet long and set one foot apart—would, he says, condense the moisture in the cloud and collect as much as 30,000,000 gallons

of water a day under the most favorable conditions.

Experimenting with a small artificial cloud in his laboratory, Dr. Schumann has succeeded in condensing the vapor into a tube when the cloud was passed between two metal disks and a potential of 30,000 volts was maintained between them. This is the basis for his mountaintop screens.

Table Mountain's "Cloth" is created by a southeast wind that blows against the mountain and is forced upward. Cooling is caused by this ascent, the saturation point is reached at a certain height, and the cloud is formed. This cloud is actually replaced every 10 or 20 minutes, but the manner of its formation gives the impression of a permanent cloud on the mountain.



Vapor would condense on the screens and the water be collected below.



The Invader in the air. Its speed, climbing power, and maneuverability fit it for its many kinds of missions.

Plane of Many Faces

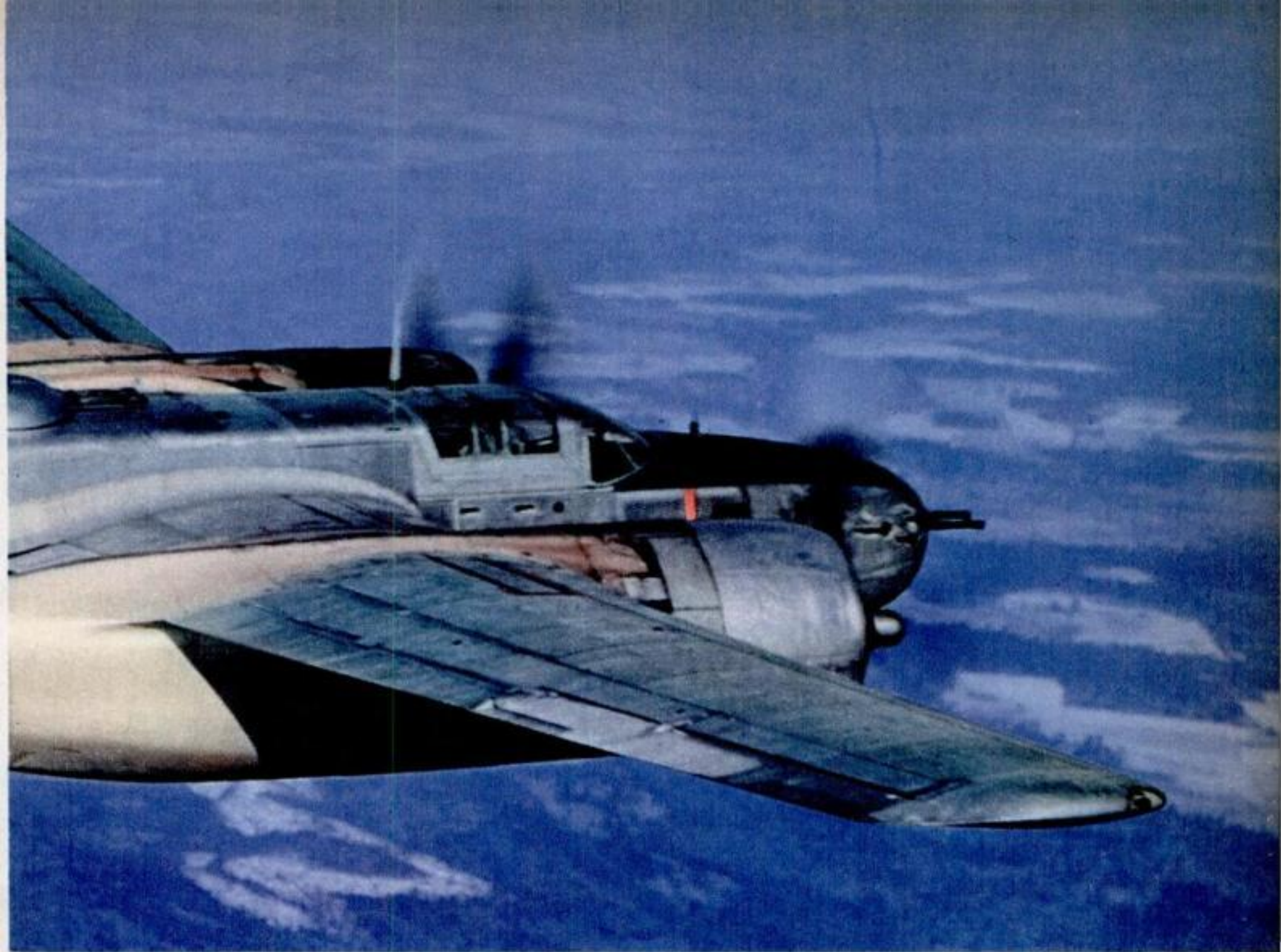
Switching noses makes the A-26 anything from a grass-cutting strafing plane to a high-level bomber.

By HAL BORLAND

YOU go down the line on an airfield and you see a group of them with cannon in their noses, then a group bristling with machine guns, then a cluster of them with Plexiglas bombardier greenhouses. You wonder if you're seeing things, for the ships all look alike except for the armament in those long, sleek snouts. You're seeing things, all right—you're seeing the Douglas

MACHINE-GUN NOSE packs six .50 calibers, four on one side and two on the other, for strafing or brushing with enemy fighters. These six guns spit nearly 5,000 bullets a minute, to say nothing of the four additional .50's in the two remote-control turrets.

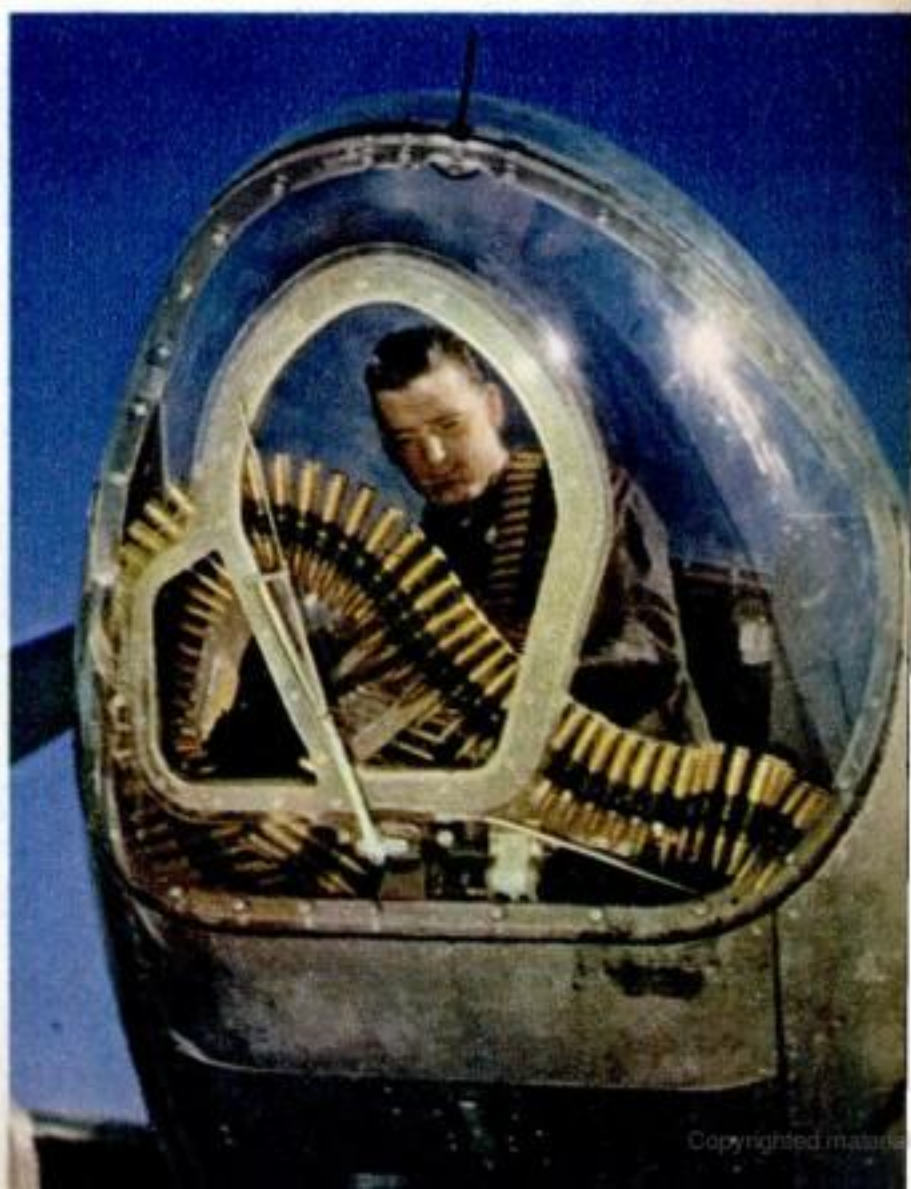




Nearly a ton of defensive armor shields its vulnerable parts; it can better 200 miles an hour on one engine.

75-MM.-CANNON NOSE carries the big gun hitherto mounted only in the B-25 Mitchell medium bomber. Three other noses offer combinations of a 75 with two .50 calibers; a 37-mm. cannon with four .50's; and a 20-mm. cannon with four .50's. Just take your pick.

BOMBING NOSE is a Plexiglas "greenhouse," here festooned with .50 caliber ammo. Changing over from one nose to another can be done in the field in about eight hours with no special equipment except a crane hoist, which can be improvised easily.



A-26, called the Invader, rigged for just a few of its various missions. Tactically, the Invader is just about the most effective attack bomber in the books.

Watch it take off, as I did recently at the Air Forces Tactical Center in Florida, and follow it for a time in the air and you begin to understand why, new as it is, it is already making a gaudy reputation for itself over enemy territory. Officially it's an attack bomber, but it has more speed than the A-20 Havoc, which can get right out and travel. Yet it has more bomb capacity and a higher ceiling than the B-25 Mitchell, which is rated at 35,000 pounds loaded weight and 25,000-foot ceiling.

For a ship of its size—its wing span is about the same as the B-26 Marauder, but its fuselage is about the length of the Havoc—it takes off in a hurry. It climbs unusually fast, reminding you of a Havoc. Put it alongside a Havoc, however, and it steadily pulls away, proving its extra speed. For a medium bomber, it maneuvers very easily. This is particularly noticeable when it is in the air with a Marauder or a Mitchell,

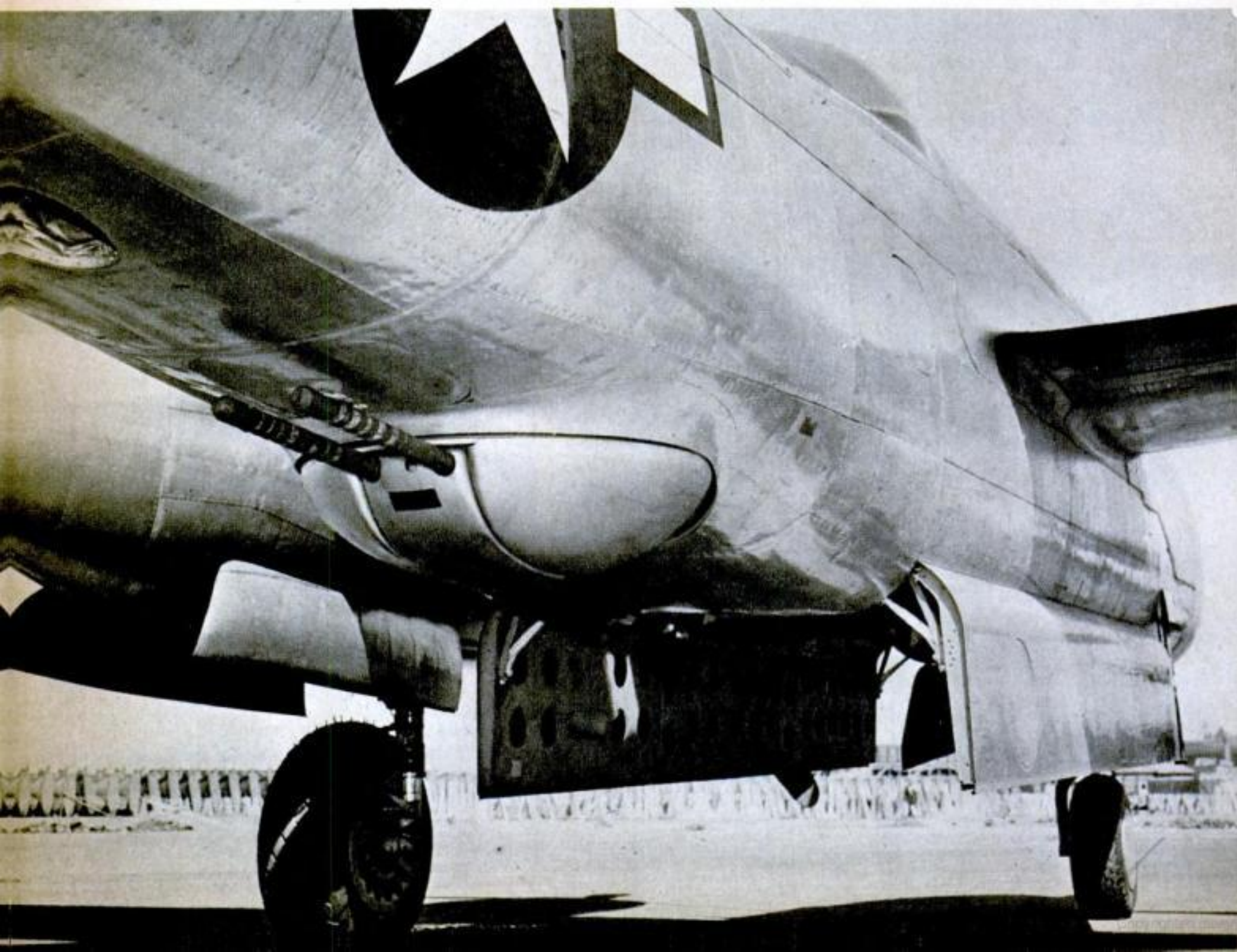
which are not exactly slow in maneuver themselves.

Name your tactical job and the Invader can do it—strafing, skip bombing, high-level bombing, tank busting, pillbox busting, general attack, reconnaissance, smoke laying. It can go anywhere in a hurry, take care of itself in a mix-up with enemy fighters, climb or dive out of trouble, and come home.

Take the factor of armament and you begin to sense why the Invader is already rated the best utility ship in the air. It can mount anything from a 75-millimeter cannon to six .50 caliber machine guns in its nose. It carries additional .50's in upper and lower turrets. It can carry .50 caliber package guns under its wings. Just try to imagine a flight of such ships on a strafing mission!

Further, it is built to take a variety of noses on the standard frame—noses designed for anything from straight bombing to every kind of attack and strafing mission. In addition to an assortment of guns in the nose, both the top and belly turrets are

BOMB BAY AND BELLY TURRET. An extra-large bomb bay enables the Invader to tote a heavy load of explosives. Exact tonnage is secret, but the plane is known to be carrying 50 percent more bomb weight than it was originally designed to handle. Note the two pairs of bomb-bay doors, with belly turret behind the rear pair.





TRICYCLE LANDING GEAR and slender fuselage show up in this rear-end view. Four Douglas-type, double-slotted flaps—two under the wings and two between engine nacelles and fuselage—slow down the "hot" A-26 for landings on short advanced-base fields. Large control surfaces boost maneuverability.

equipped with twin 50's. And there is no reason why such a ship should not mount rockets instead of package guns under its wings.

Yet the Invader can operate with as few as two men, pilot and gunner. There is ample room for a third or even a fourth crewman if needed on a particular mission.

Two things contribute to this ship's versatility and tremendous punch:

First of all, it is fundamentally a fast, rugged ship of excellent design and flight characteristics. An all-metal mid-wing monoplane with single tail and tricycle landing gear, its twin Pratt & Whitney double-row engines develop as much power as the Marauder. Its sleek lines enable it to make the most of that power. All important drag elements have been eliminated or carefully faired in. Pilot's compartment is of teardrop design. Turrets are of low silhouette, close-set—so close that you have to look twice to spot the belly guns.

Second, it can be converted from one job to another by changing noses. This is made possible by standardized design and development of an assortment of noses. Quick conversion does not mean changing the ship's nose in a matter of minutes, but the change can be made in the field in about eight hours with no other special equipment than an improvised crane hoist. Eight hours is a considerable gain over the time need¹ to send a ship to a modification center for conversion.

At present, six different noses are available for use on the Invader. Some of these may be further altered or discontinued, as experience in the field dictates. Each has its special purpose, and none may be considered a "standard nose." Noses now listed, with various combinations of cannon and .50 caliber guns, are:

- 1—Plexiglas "greenhouse" for bombing.
- 2—Metal nose mounting one 75-mm. cannon.

- 3—Metal nose with one 75 and two .50's.
- 4—Metal nose with one 37-mm. cannon and four .50's.
- 5—Metal nose with one 20-mm. cannon and four .50's.
- 6—Metal nose with six .50's.

Watch the Invader sweep down across a field and you can imagine what the Germans have had to face when this ship was on a strafing mission, with a flock of those .50's spitting hot steel. Or what it can do to a tank column or a group of pillboxes, with that 75 cannon action, supported by all those .50's. And it comes in on such a sweep with baffling speed, gets away in a considerable hurry. If you were trying to face it down with an ack-ack gun you wouldn't get more than a couple of quick glimpses of it before it was gone.

It is easy to imagine what this plane can do on a skip-bombing mission. Its speed and bomb capacity should make it a highly respected ship in that category, for it comes in like the wind, weaves away with exceptional dexterity, and is gone.

Take it on as opponent in the air, and you would have plenty of trouble. Its turrets are of a type used with remote fire control. All four of the .50's in those turrets can be used to ward off attack from the rear or from either side. From the front, it is simply devastating. Offhand, it would seem that this ship has few, if any, vulnerable spots. Its guns can pretty well cover all approaches, and it can throw enough slugs to break the heart of any armorer loading its ammunition boxes.

Its field uses depend entirely on situations

as they arise. It was specially designed to perform any one of a dozen jobs and is not a composite of other models or an adaptation of earlier designs. It was expected to make obsolescent three top-ranking planes, all well known for their powers of devastation: the A-20 Havoc attack plane, the B-26 Marauder medium bomber, and the B-25 Mitchell medium bomber and attack plane. That's quite an order, but when you see what it can do you know that these other doughty ships are going to have to step right out to hold their prestige. For here is a ship with more speed, a higher ceiling, and a greater bomb capacity than any of those three; in addition it has considerably more firepower, carries close to a ton of defensive armor, and can cruise at better than 200 miles an hour on one engine. Obviously, a ship that can take as well as give a lot of punishment and still come home.

But it's that interchangeable nose that gives the Invader its tremendous tactical advantage. That's what makes it the equivalent of six ships in one. To remove a nose, which is about six feet long, only six bolts need be removed. When electrical and gun-control cables have been disconnected, the nose can be swung away, a new nose swung into place, fitted there, and bolted. It isn't as simple or as easy as it sounds, but the job can be done between late dawn and early dusk—all connections hooked up, guns loaded, and the ship made ready for a new kind of mission.

The same kind of job can be done for a ship with a damaged nose, too—a great ad-

A QUICK-ACCESS HATCH opens on pilot's teardrop cockpit. The Invader can be fought by two men—pilot and gunner—but there is room for four if the mission calls for them. In this photo you can see clearly where the interchangeable noses join the fuselage, just ahead of the nose-wheel opening.





SPEEDY ENGINE REPAIRS are made possible by engine-nacelle cowling that comes off in halves. A spark-plug wrench loosens the fastenings, and the top and bottom sections are taken off. Removing or replacing takes only a few minutes. Mechanics like the A-26. "For once," says one, "they thought about the 'mech'."

vantage from the repair and maintenance point of view. Naturally, after a ship has been in combat and wracked a bit, it isn't as easy to slip a new nose into place as a finicky mechanic might wish. But this ship as a whole gets high praise from the mechs who work on it.

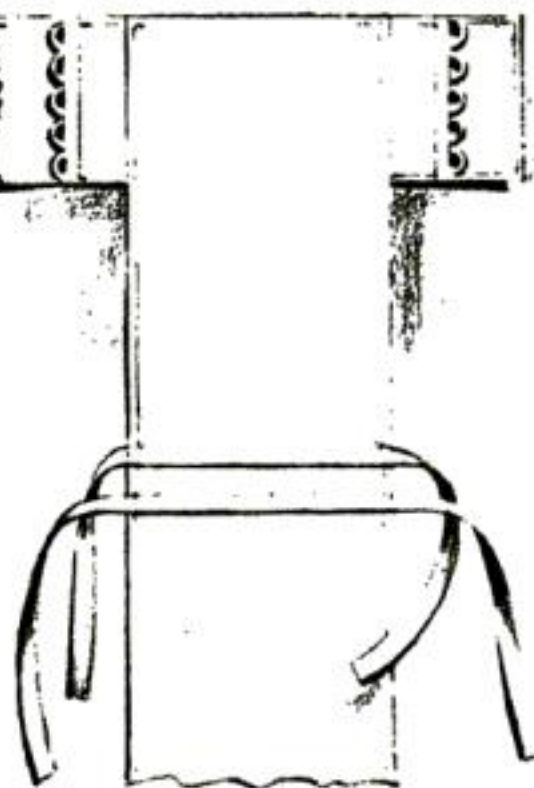
"For once," says one mechanic, "they

were thinking about the mech when they designed her. Why, you can even sit down in the accessory section. Imagine sitting down to change batteries! And the mags are out where you can get at them easy. Engine cowling is in two sections. Engines easy to service. She's a very sweet job, Mister, a very [\(Continued on page 206\)](#)



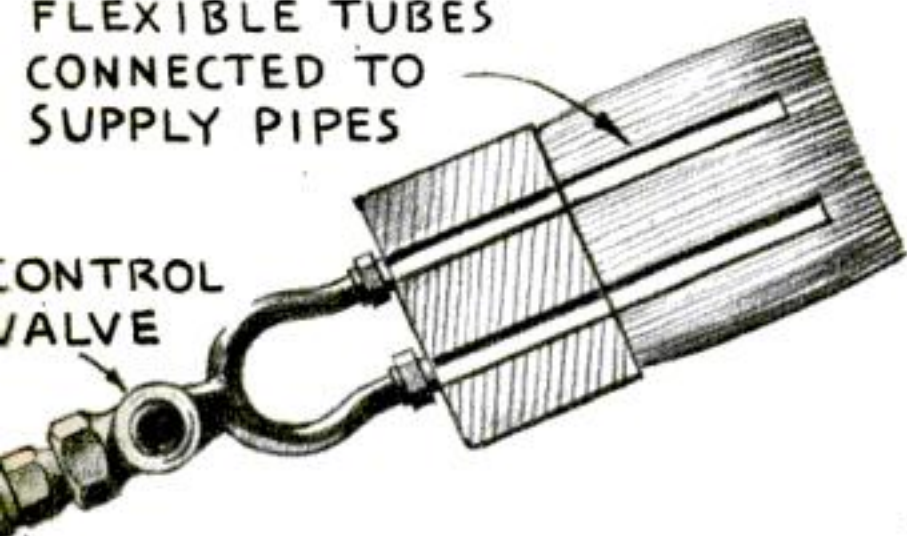
ABDOMINAL
SUPPORTER

DOUBLE-DUTY DIAPER fills all the requirements of the traditional three-cornered pants and also includes a sewed-on abdominal band. It is secured on Junior by lacing tapes through loops on the bellyband, which does away with the need for pins. When the diaper is adjusted, a double thickness of material covers the baby's crotch. The designer is A. H. Sonnenberg, East Elmhurst, N. Y.



FLEXIBLE TUBES
CONNECTED TO
SUPPLY PIPES

CONTROL
VALVE



COME-APART FLOWERPOT was devised by Charles F. Gomez of Calistoga, Calif., so that there would be a minimum of disturbance to the root system of a plant in transplanting. The pot is collapsed by pressing the top section downward, releasing the binding effect of fabric strips that hold the parts together.

ALWAYS A FULL BRUSH of paint is assured the painter who uses the brush invented by George J. Rasch, Venice, Calif. Paint is fed through a hose that leads to flexible tubes within the bristles, eliminating the necessity of dipping the brush into the can each time paint is needed, and speeding up the job. A valve on the connection between the hose and the tubes controls the flow of paint into the bristles.

the inventors



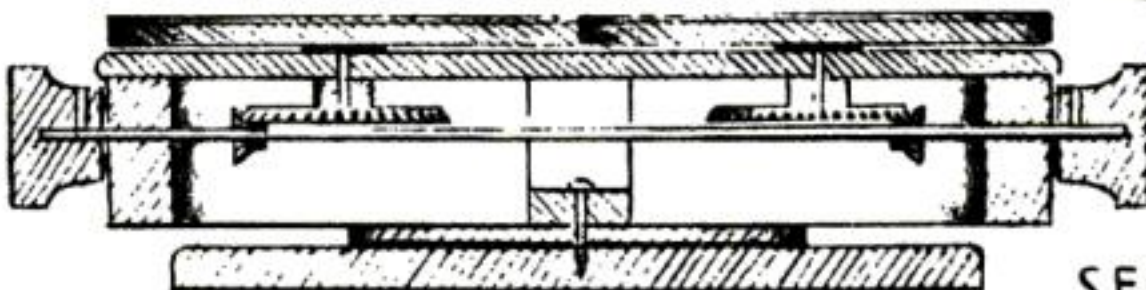
AIDS FOR DRINKING. Two innovations to make your liquid refreshments more inviting are the beverage cup (left) originated by V. Pera of Pinole, Calif., and the ice guard, called Ice-A-Way by its inventor, Raymond F. Swing of Seattle, Wash. The beverage cup is so designed that its contents may

be drunk through a straw inserted in a spout that forms part of the handle. The liquid is drawn from the bottom to avoid the drinking of "suds" or foam at the top. Ice-A-Way was designed to permit the drinking of iced drinks without allowing the ice to come into contact with the drinker's lips when the glass is tilted.

SHOWING THE WORLD at a glance so that the true relationship between the continents and countries may be readily seen is the purpose of this presentation devised by Paul von Rohlf of St. Paul, Minn. Maps of the Eastern and Western Hemispheres are mounted

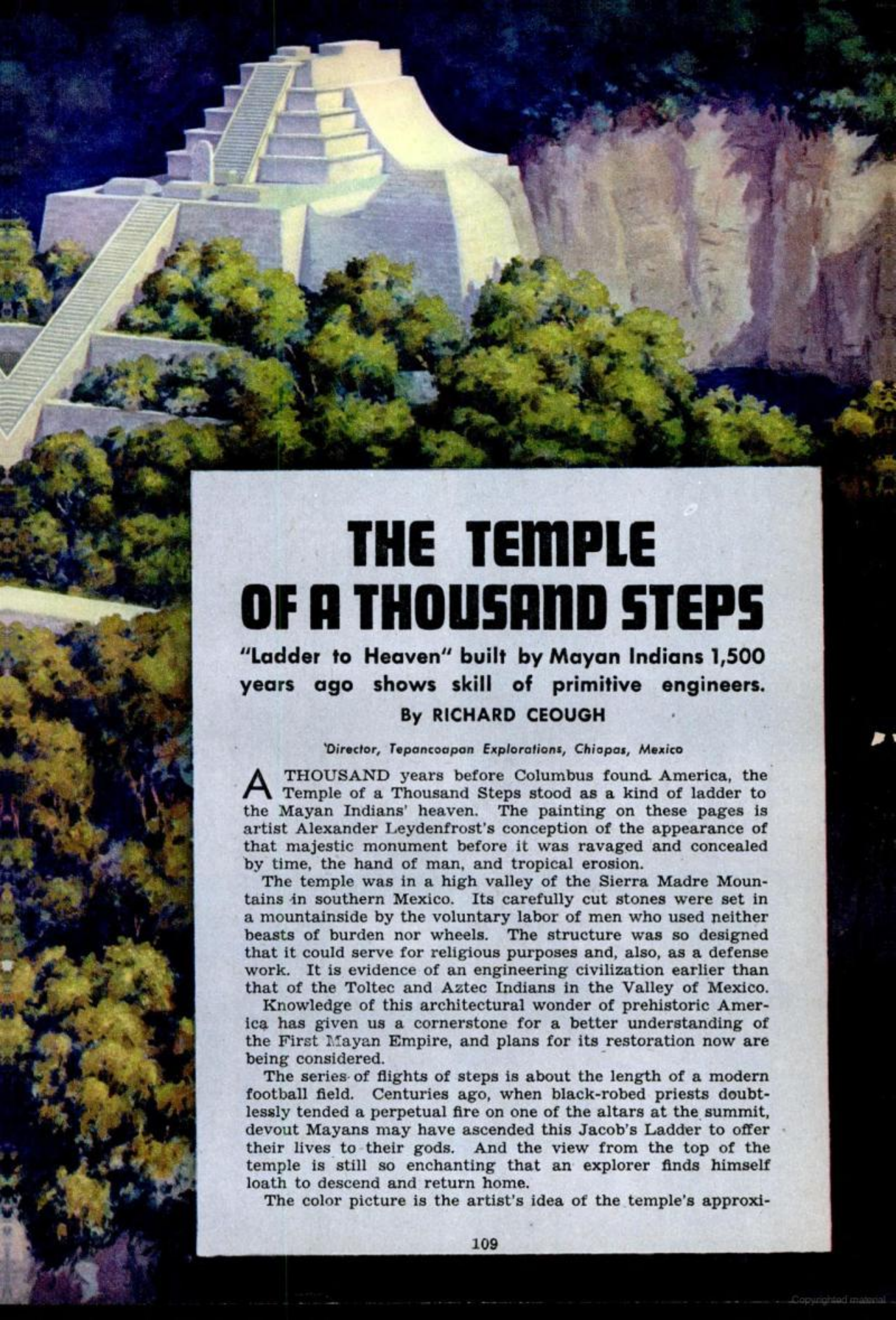
side by side on disks which may be rotated by turning either or both of the operating knobs. When one disk moves clockwise the other moves counterclockwise, so that adjacent portions of the two hemispheres can be brought into their proper relationship with each other.

KNOBS
OPERATE
BEVEL
GEARS ON
SINGLE SHAFT,
ROTATING
DISKS TOGETHER



SECTION





THE TEMPLE OF A THOUSAND STEPS

"Ladder to Heaven" built by Mayan Indians 1,500 years ago shows skill of primitive engineers.

By RICHARD CEOUGH

Director, Tepancoapan Explorations, Chiapas, Mexico

A THOUSAND years before Columbus found America, the Temple of a Thousand Steps stood as a kind of ladder to the Mayan Indians' heaven. The painting on these pages is artist Alexander Leydenfrost's conception of the appearance of that majestic monument before it was ravaged and concealed by time, the hand of man, and tropical erosion.

The temple was in a high valley of the Sierra Madre Mountains in southern Mexico. Its carefully cut stones were set in a mountainside by the voluntary labor of men who used neither beasts of burden nor wheels. The structure was so designed that it could serve for religious purposes and, also, as a defense work. It is evidence of an engineering civilization earlier than that of the Toltec and Aztec Indians in the Valley of Mexico.

Knowledge of this architectural wonder of prehistoric America has given us a cornerstone for a better understanding of the First Mayan Empire, and plans for its restoration now are being considered.

The series of flights of steps is about the length of a modern football field. Centuries ago, when black-robed priests doubtlessly tended a perpetual fire on one of the altars at the summit, devout Mayans may have ascended this Jacob's Ladder to offer their lives to their gods. And the view from the top of the temple is still so enchanting that an explorer finds himself loath to descend and return home.

The color picture is the artist's idea of the temple's approxi-



Time and nature have done their best to conceal the remains of the Mayan civilization. This green-clad hill was the site of the Pyramid of Yalmuz, Son of Sorrow, older than the Temple of a Thousand Steps.



The southwest corner of the upper pyramid at Agua Azul as it is today after about 15 centuries. There is evidence that stones were joined with hard cement.

mate appearance long before Europeans set foot in the New World. It was produced for POPULAR SCIENCE MONTHLY from field sketches and photographs made by a recent expedition conducted under my direction in Chiapas, the Pacific-coast state of Mexico that adjoins Guatemala. The expedition was sponsored by the Mexican Ministry of Education through the National Institute of Anthropology and History of Mexico, of which Dr. Ignacio Marquina is General Director, and Dr. Enrique Juan Palacios is Director of pre-Hispanic Monuments. I am now organizing another expedition under the same auspices to carry through the final stages of the exploration.

The general civilization of which this temple is dramatic evidence probably arose during the first century. Authorities say that its last known records appear in the

These bones from the ancient tombs of Agua Azul may be relics of devout Mayans who built the Temple of a Thousand Steps and served in its rites.





An idol found at Tepancoapan is one of the evidences of Mayans' religious worship in temple's heyday.



Here is the old spillway at Agua Azul. It was built to carry off water from the basin above the dam, and still works.



Upper part of the stele, or tablet, that stood at the foot of the final flight in the stairway of the temple. Experts believe that the battered hieroglyphs will establish the date of the structure.

seventh century. Europe was then in the grip of the Dark Ages, and most of North America was a thinly populated wilderness. But this fertile valley, blessed with an abundance of rain, supported many people in beautifully organized suburban communities.

In the beginning, the Mayans used nature's gifts for their religious purposes; hills, for example, were utilized as natural foundations for pyramids. But the many steps of this temple do not rest flat on the slope of the mountain. They are built out as an independent structure. Each stone was cut and fitted by workmen who had few, if any, metal tools. And the stones were held together with a hard cement or concrete containing small cracked stones, very much like modern concrete. Sand-and-

gravel plasters were used within the tombs.

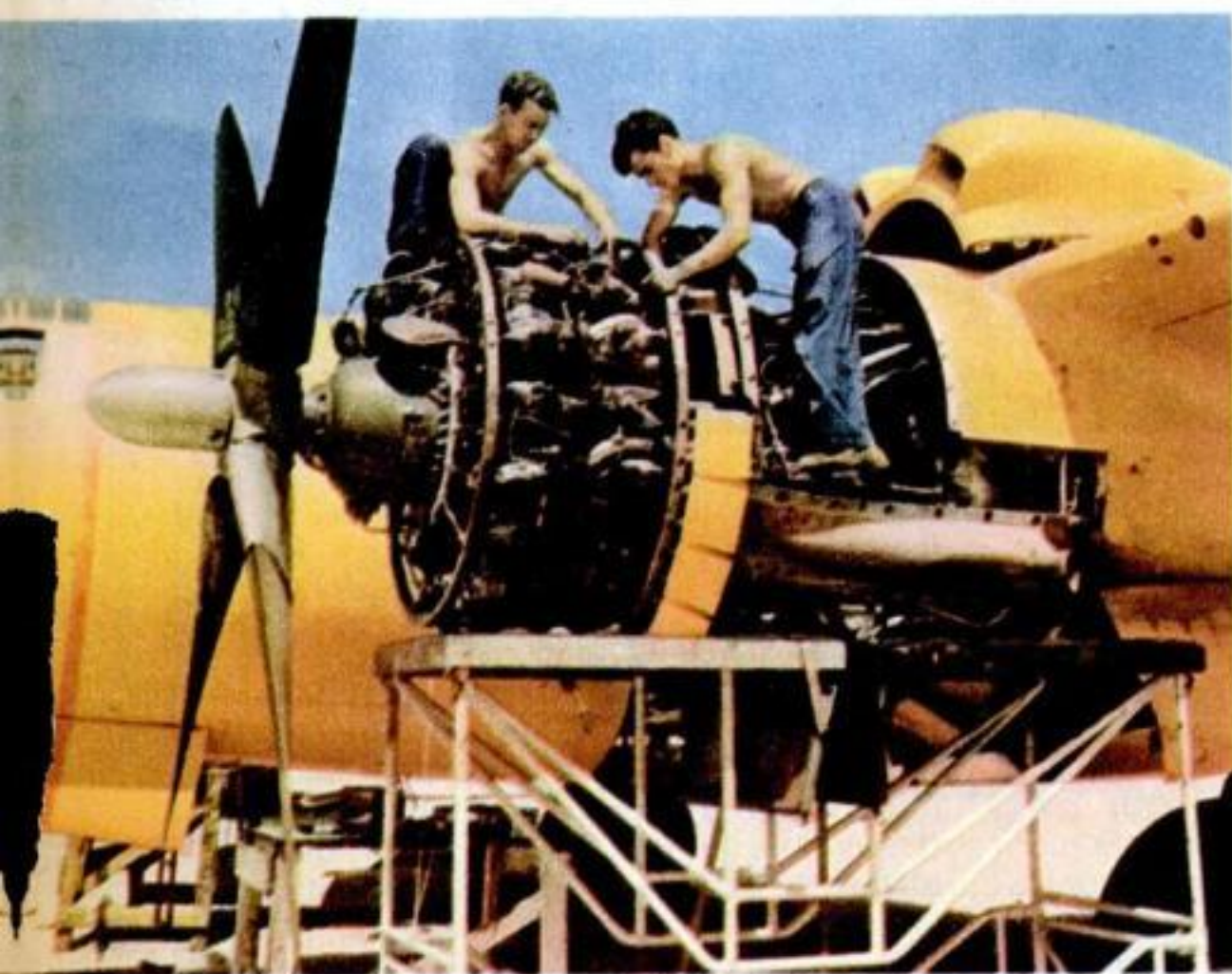
In addition to understanding the rudiments of heavy-stone engineering, the Indians were aware of the use of paint, and this whole edifice may have been painted, although at present there is no direct evidence of this.

The Mayans have been described as peace-loving people, but this temple suggests that they appreciated the value of fortifications. The pyramids on the lower platform obviously could have been used as defense bastions; particularly from the sides of the larger one, effective sorties could easily have been made with clubs, hatchets, and spears. The intermediate platforms and terraces may have served the same purpose, as well as for solid, defensive operations. (*Continued on page 206*)



A Navy JM-1 takes to the air from a field at the important Admiralty Islands naval base. It will sharpen the eyes of AA gunners on our fighting ships at sea by giving them fast-moving, high-flying targets.

Sparring Partners for Navy Gunners



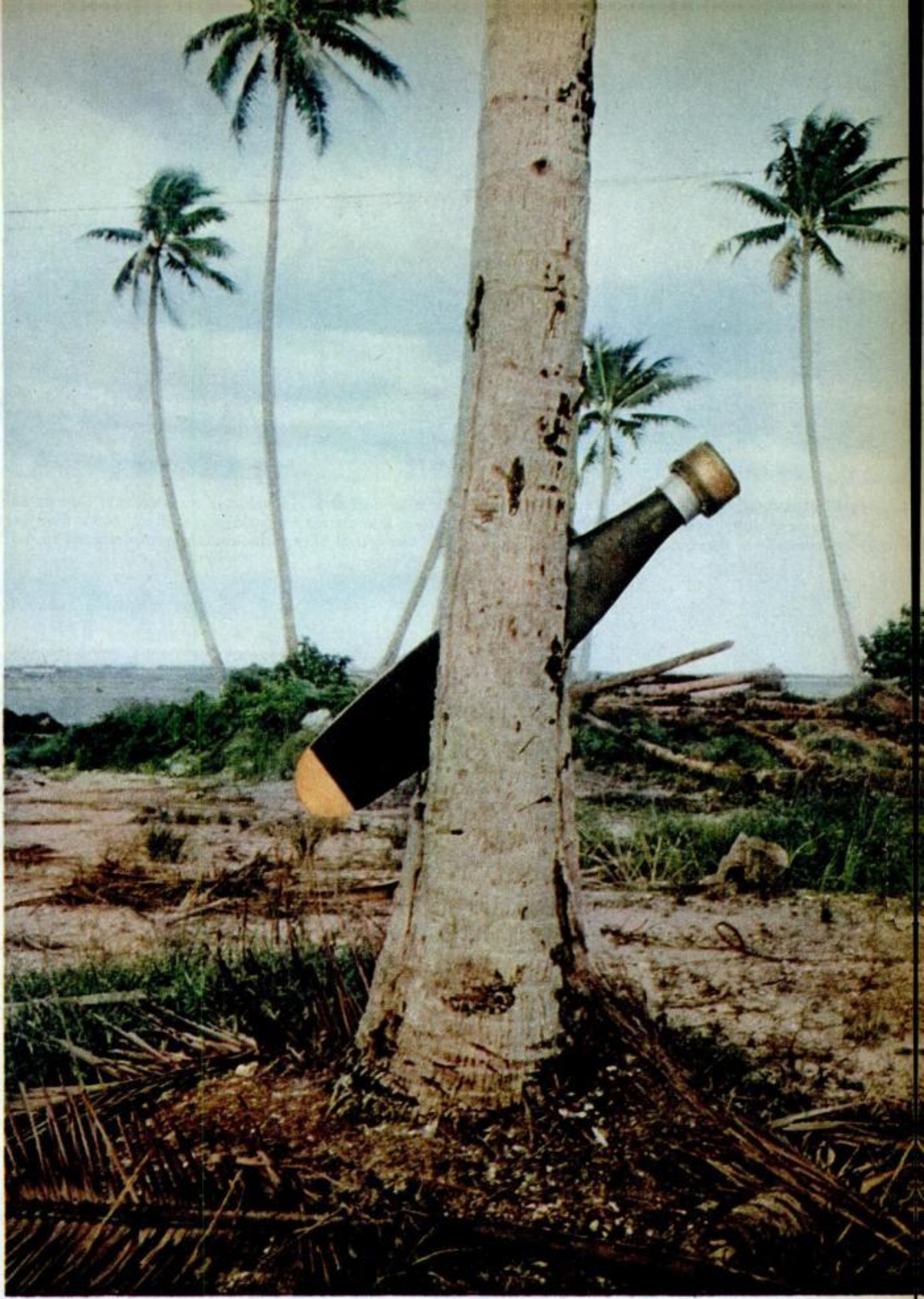
Ground-crew men go over one of the 2,000-hp. engines of a JM-1 in the course of the "60-hour" check that keeps these utility planes flying.

Tuning up. The JM-1 is an adaptation of the Army B-26 Martin Marauder bomber. Its speed has been increased by stripping it of all armament.

Official U. S. Navy Photos

WHEN you read about Navy antiaircraft gunners knocking Jap flyers out of the sky, you can give some of the credit to the hard-working JM-1 utility plane. This long-range, land-based craft is an adaptation of the Army's B-26 Martin Marauder, stripped of its armament and used for towing sleeve targets. Flying from airfields in the Admiralty Islands, JM-1s accompany our fighting ships at sea and give the men at the AA guns worthwhile practice on targets towed 20,000 feet high at speeds close to 350 miles an hour. This practice pays off in combat.





STRANGE FRUIT. A Navy FM-2 fighter plane (General Motors version of the Grumman Wildcat) left this souvenir of war in a palm tree in the Admiralty Islands. Coming in for a crash landing, it swerved off the field and buried its prop in the tree. U. S. Navy Photo.

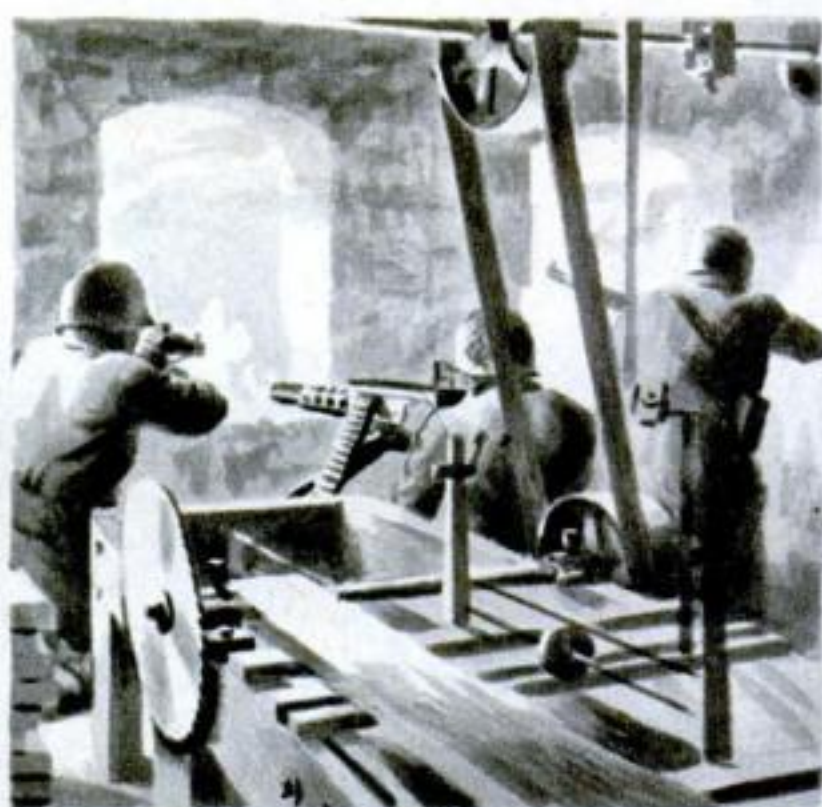
How Cooks and Clerks



1 VILLAGERS WERE HAPPY when U. S. tanks and armored vehicles rumbled into Hotton, Belgium, a few days before Christmas, 1944. "The brave Americans" would save them from the Germans advancing in the Battle of the Bulge. They didn't know that only rear-echelon men remained in the town.



4 THE NAZI PAID a few minutes later when an Engineer bazooka team took him on. The rocket projectiles bounced off the tank's hide, but one ignited some gasoline spilled in refueling. The krauts tumbled out.



5 DEFENSE POSTS, manned by cooks, clerks, mechanics, and radio operators, had been set up in the local sawmill, schoolhouse, hotel, and other points of vantage.

8 AMMUNITION WAS LOW. The mortar crews had used almost their last rounds in breaking up that last threat. There was nothing to do but sweat it out while a couple of officers in a jeep ran the gantlet of German fire on the north road to bring back a load of ammunition from the division CP.



Stopped the Panzers



2 MORTAR FIRE interrupted breakfast for the headquarters company next morning. Germans were trying to cut the strategic highway at Hotton.



3 A DISABLED M-4, left behind for repairs, went gamely out to meet a Nazi Mark V. Its first punch missed; it didn't get another.



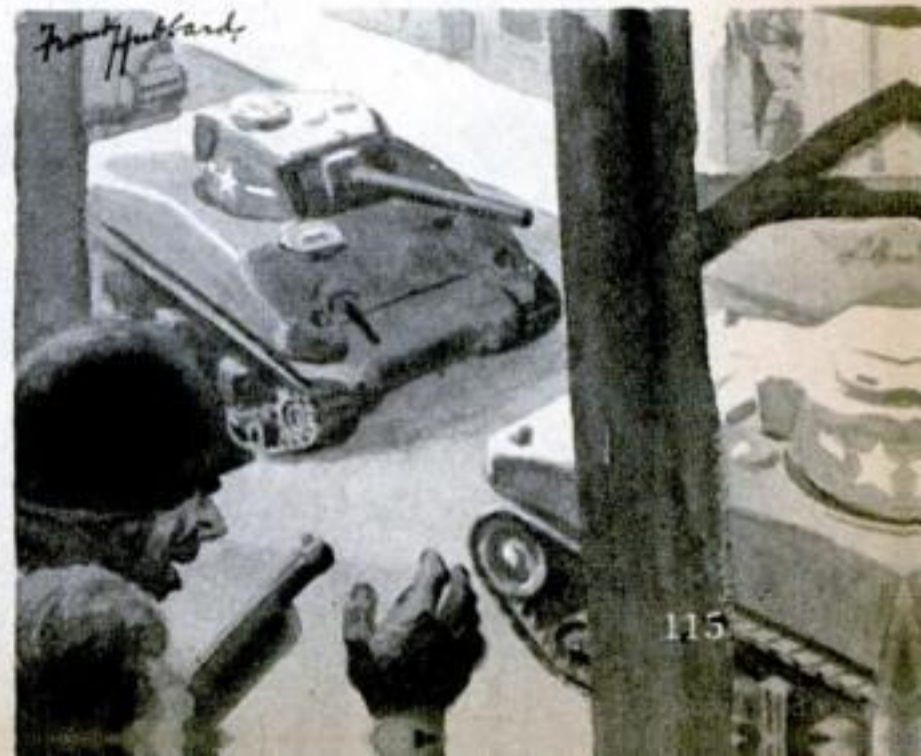
6 A WATCHFUL NIGHT followed a day of pounding by mortar and rifle fire. A T/5, manning a machine gun, sprayed an advancing shape. Dawn's early light revealed a dead sheep.



7 NEXT MORNING, the defenders were reinforced by a platoon of 81-mm. mortars. When the commander of an outpost saw Germans massing, he phoned for mortar fire. Five rounds hit the target.

9 DRIVEN BACK, the Yanks formed their line along the railroad track. At 0200 the Jerries came on again, but this time the cooks and clerks held fast.

10 RELIEF came at dawn—five medium tanks with infantry support. The rear-echelon men had stopped the Panzers and held the vital road.



My Sweetheart Is a BLACK WIDOW

Fly with a night-fighter ace
and see how the famous P-61
plays blindman's buff with Jap
raiders—and wins every time!

By
MAJ. CARROLL C. SMITH
As told to **ANDREW R. BOONE**

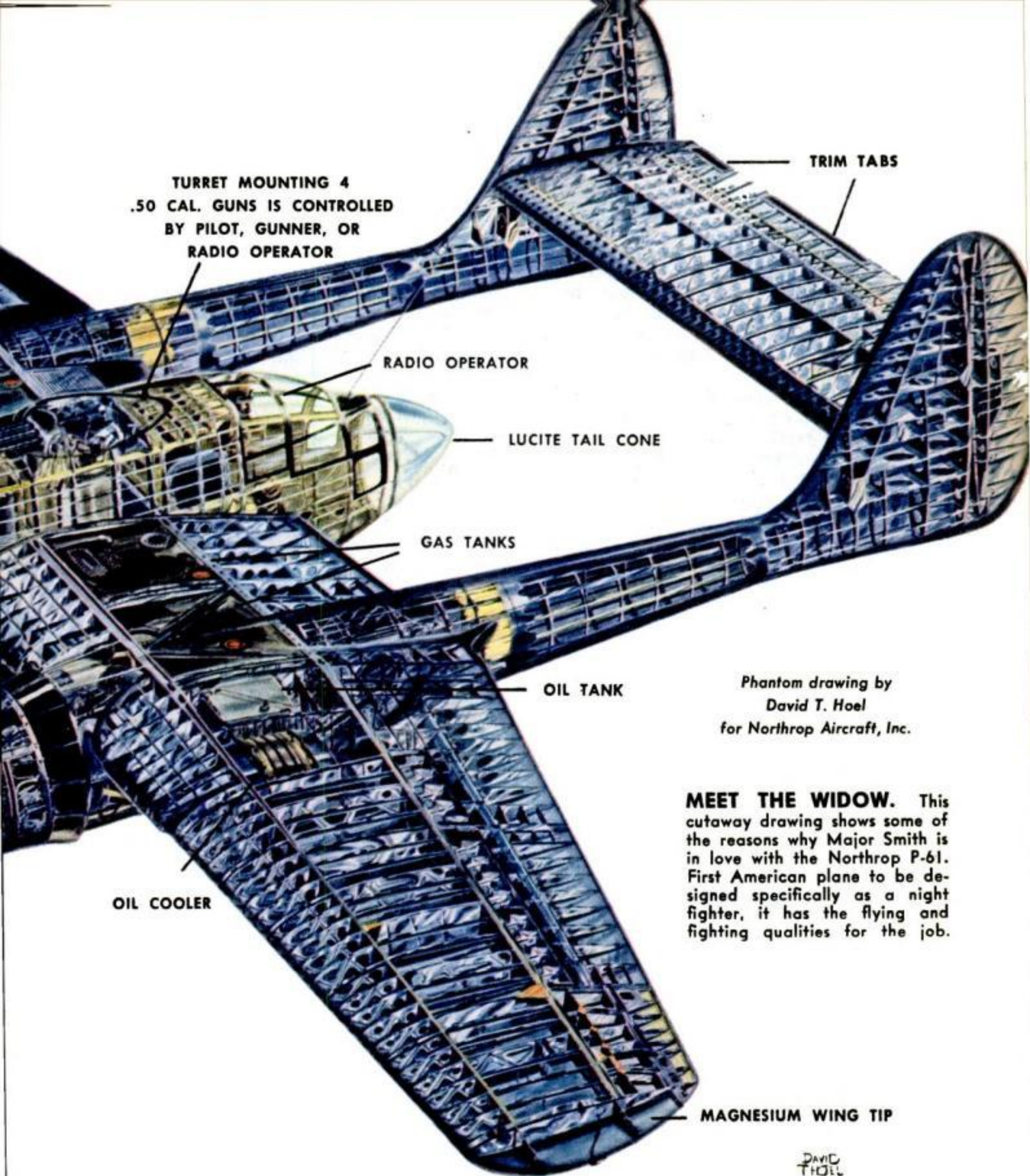
THE AUTHOR qualified as the first night-fighter ace of the war when he bagged seven Japs in four of his 139 night missions in the Pacific. Five of the enemy planes fell to the 20-mm. cannon of his Black Widow "Time's a-Wastin'," and he got the two others when he was piloting P-38's. He has been awarded the Air Medal with one cluster, and recommended for the Silver Star and Distinguished Flying Cross. Twenty-seven years old, he is now serving on the staff of the Fourth Air Force Night Fighter School, at Hammer Field, Calif.



THAT Jap pilot tooling his twin-engine Dinah Mark II toward our airstrip at Morotai wasn't worried. At 8,000 feet his fighter was invisible (he thought), his 20-mm. cannon and 7.7-mm. machine guns would protect him in a clinch, and as a last resort he could climb a mile in 90 seconds or so to evade us.

He hadn't the foggiest notion that Lt. Phil Porter and I were floating in the

POPULAR SCIENCE



Phantom drawing by
David T. Hoel
for Northrop Aircraft, Inc.

MEET THE WIDOW. This cutaway drawing shows some of the reasons why Major Smith is in love with the Northrop P-61. First American plane to be designed specifically as a night fighter, it has the flying and fighting qualities for the job.

DAVID
HOEL

moonlit night over the field, throttled to minimum cruising. We were saving gas, to make sure we'd have plenty in case a Nip came over.

He still wasn't worried when our ground control picked him up and flashed the first order: "Darkie One from Nightie. Climb to 8,000 . . . course two zero zero . . . range about 12 miles." Instantly I turned my attention to my instruments. Phil

shouted instructions as I swung the Black Widow onto the new heading. I flipped on the water injection to pull another six inches of manifold pressure. That meant 200 to 300 more horsepower from the big Pratt & Whitneys . . . 300 feet a minute faster climb.

While ground control continued directing us toward the incoming fighter, I climbed and turned with everything jammed

to the fire wall. The Jap was headed for our field, bearing a load of medium bombs. A few more seconds, and we spotted each other in the brilliant moonlight, at a range of 2,000 feet. He then was within a mile of our base.

Talk about evasive action! That boy could fly: He was worried now, for the Nips had heard about these deadly Black Widows. Ours were fairly new, but those four 20-mm. cannons spouting flame and shells from the belly spelled certain and swift destruction to any fighter or bomber within range.

I could see him easily as he climbed. His maneuver was no good, for the Widow was climbing even faster. I began overhauling him at 17,500. Three bursts failed to hit. The fourth and fifth seemed to do little damage. For the sixth I managed to pull in within 150 feet of his left wing and cut loose with a full deflection shot as he roared past. Chunks exploded from the glistening Dinah. He fell, burning, a plume of smoke following him to earth.

This was not my first kill. Some time earlier, while flying a P-38 Lightning over Jap-held Alexishaven, New Guinea, on dusk

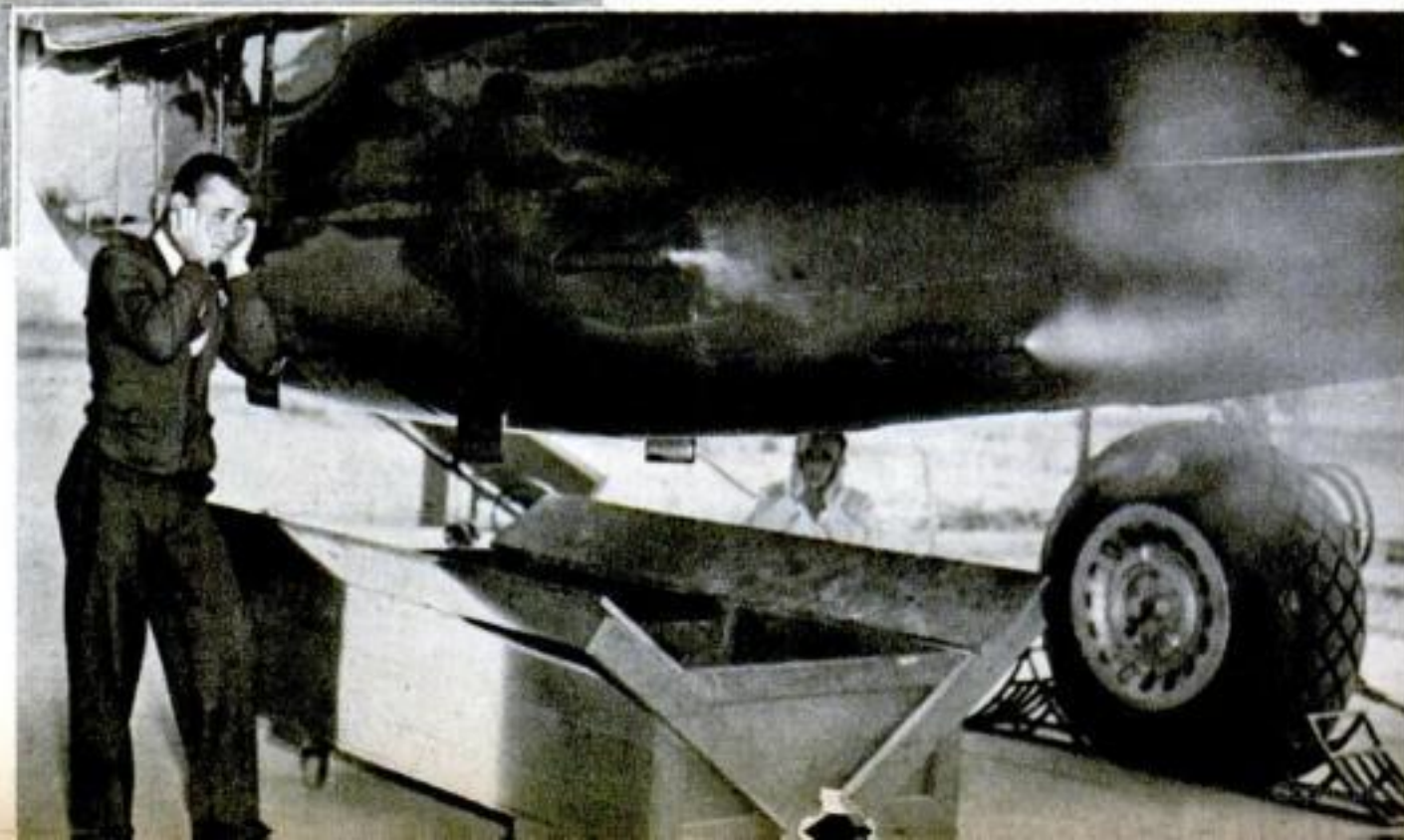
patrol, I had picked off a Val dive bomber as the plane was about to land. Three bursts of about 150, 30, and 20 rounds blasted its crew to their honorable ancestors. But now the Black Widows were beginning to arrive. Here we had the first American plane specially designed for night fighting. With it we could do things under cover of darkness that we dared not attempt with other types.

Three weeks later, while flying a Lightning, I snagged on successive nights a probable, one Betty, and a probable. The Betty is a twin-engine medium bomber similar to our Mitchell. Shooting down a Betty from a P-38 isn't like smashing one from a Widow in complete darkness. Searchlights picked her out and held her for me, and I ran her down after she had unloaded her bombs on Morotai. She couldn't climb like the Dinah, so I got her with two bursts from directly behind as we screamed down. My air-speed meter indicated 475; actually it was much more. Betty began to burn as I shot past, and cartwheeled into the water offshore.

Shooting down Nips at night gives you a grim satisfaction unmatched by daytime victories. Aided by detection equipment, you can stalk them as a tiger stalks its prey and blast them into the beyond, frequently before they know you're tailing them.

For the record, the Widows have "killed" nearly every plane shot at since they first started west from the Northrop plant in California in June 1944. Not one Widow has been lost, at this writing, to enemy action in the

20-MM. CANNONS (four of them) in the belly of the P-61 can knock out anything that flies. Once a "fix" is obtained on an enemy plane, these and the four .50 caliber machine guns in the top turret leave little chance of escape.



BIG NOISE is the result when ordnance men test the 20's on the ground. The box is placed under the fuselage to catch the empty shells.



TAKING OFF, the Black Widow climbs steeply and swiftly. The full-span wing flaps which make this possible also give the big ship remarkably low landing speed, enabling it to use small fields at night. The twin fins and rudders, supported by monocoque tail booms, give a resemblance to the P-38 Lightning.

Pacific. I know of only one to be missing on a mission, and I have fairly good reason to think that its crew ditched near the Philippines, and that they are safe today.

I was skeptical of the first Black Widow I saw. "She's awkward as a box kite," I remember thinking. "She's too big and clumsy to be a fighter." But when you make high-speed stalls into a dead engine, in the dead *(Continued on page 207)*

FOUR-GUN TURRET is being lowered at right into the crew nacelle of a new Widow. The .50 caliber guns will be set in the revolving drum at the top. Turret is electrically operated. Below, gun setter parallels guns with a bore-setting 'scope.



Why

SEVEN! Dice have been used for amusement and gambling since the days of the ancient Egyptians and the Greeks. Today's dice differ in no material respect from those of the earliest times, and our present game of craps is a simplified version of hazard, an old French game.

POSSIBILITIES. With two standard dice, exactly 36 different combinations are possible. The odds against throwing any given number are mathematically fixed. A 7, for instance, will come up approximately 166.6 times out of any 1,000 throws.

ONE WAY
TO MAKE A 2 ▶



TWO WAYS
TO MAKE A 3 ▶



THREE WAYS
TO MAKE A 4 ▶



FOUR WAYS
TO MAKE A 5 ▶



FIVE WAYS
TO MAKE A 6 ▶



SIX WAYS
TO MAKE A 7 ▶



FIVE WAYS
TO MAKE AN 8 ▶



FOUR WAYS
TO MAKE A 9 ▶



THREE WAYS
TO MAKE A 10 ▶



TWO WAYS
TO MAKE AN 11 ▶



ONE WAY
TO MAKE A 12 ▶



Dice Behave as They Do

MATHEMATICAL ODDS PREVAIL IN CRAP SHOOTING —IF THE CUBES AND PLAYERS ARE ON THE LEVEL

By **GOLD V. SANDERS**

Photographs by **WILLIAM W. MORRIS**

LOOK into the science of the game called crap shooting, and you may be surprised to find that the number seven comes by its magical reputation honestly. It is the champion, not from superstition, but by right of mathematical merit.

With some ten million men in our fighting forces, a lot of craps is being shot. It is said that millions of dollars change hands every month. Most of the boys are rank amateurs. A few who might be called professionals with the dice are raking in the dough.

Since crap shooting is evidently here to stay, judging by its several centuries of popularity, it is high time its devotees learned something of the science of the game, just as card players study the technique of bridge. The odds can be figured exactly, and it is not hard to do.

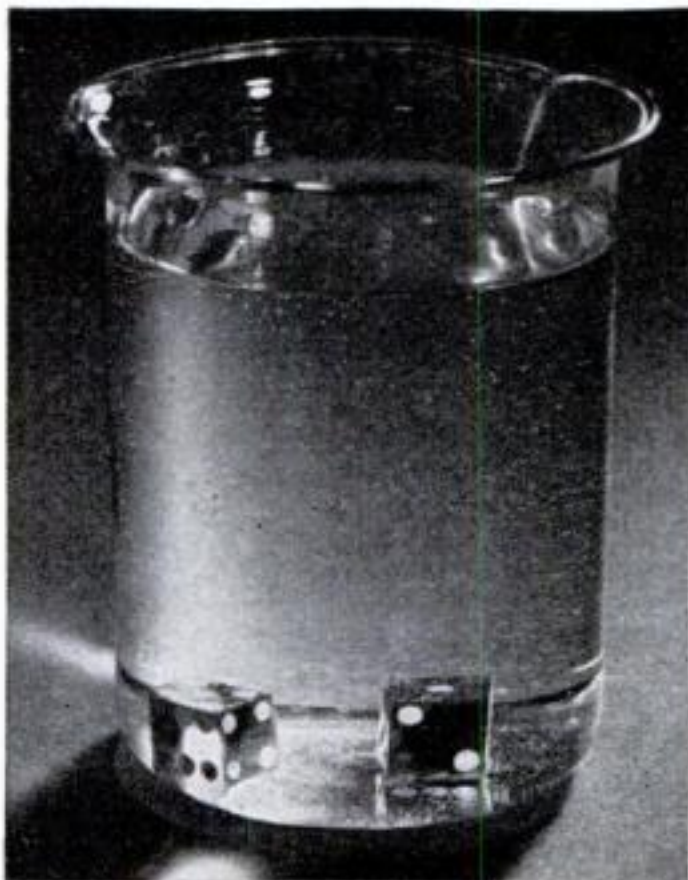
There are 36 possible combinations of the two dice. Each number has a mathematical certainty to it. For example, there are six ways to make seven, and that is not true of any other number. The table on the opposite page shows the chances of each number turning up when a pair of standard dice are used.

Since the object of the game is to throw your point before seven comes up, the odds must be figured as between each number and seven. Six and eight are the best points, but the odds against them are six to five. When it comes to the ever-popular Little Joe, the point of four, the table shows that this is a very bad number, the odds against it being two to one.

The man who is throwing the dice is always on the short end, though a lot of crapshooters seem to be happy when it comes their turn to shoot. The rules of the game doubtless were made in an effort to even up

TWO SIMPLE WAYS TO TEST TRUENESS OF DICE

You can easily discover if dice are imperfect. Simply hold three cubes of the same size, as at the right, leaving a measuring space. Try a fourth die in this space, fitting it in the three different positions. A perfect die will slide in and out with no room to spare. Drop the dice into a glass of water. If any side is weighted, it will always turn downward.



MULLIGAN

ANY number of players. Five dice. A score sheet is kept, a line for each man:

PLAYERS	1	2	3	4	5	6	M	TOTAL
JONES				12				
SMITH		8						

The object is to make the highest score. Each player has three rolls for each of his seven squares. The second and third rolls are like the draws in poker, made to improve any pairs, or better, made on the first roll. After the third roll, the total spots on matching dice are added and placed in the square where they belong, according to denomination.

In the sample score sheet above, Jones made three fours on his three rolls. These were added and scored under the numeral 4. Smith has made four deuces, which added up to 8 and were placed under the numeral 2. The game ends when all players have filled all their squares, including mulligan, the seventh square.

Mulligan counts 24 and is made only by

completing the combination 1, 2, 3, 4, 5 with one, two, or three rolls. If the player tries for mulligan and fails, he enters a zero under *M*.

A player may draw to any number thrown on the first roll, whether it is paired or not. Say he rolls one six and leaves it. If he fails to better it, he gets a total of six in the 6 column. If a player does not like his first roll, he can pick up all five dice for his second roll, and do the same for the third.

BASEBALL

NINE innings are played. Two dice. Two players, or two teams.

Each point of the dice is a play of some kind, for or against the roller. Each side rolls until the side is out, that is, three outs to the inning. Scoring continues until the side is out. Following are the plays called for by the corresponding points:

Point	Play
2	Home run
3	Double play if man on base; otherwise, out
4	Base on balls
5	Out
6	Out
7	Out

this situation. That is why the thrower is given a chance to win on his "come out" roll by making seven or eleven. But the chances against this are still pretty high. It has been figured that from the moment a man picks up the dice, the odds are against him by 1.41 percent. Notice that in all gambling houses it is the guest who throws the dice, not the house.

Here are the odds against the thrower on each point:

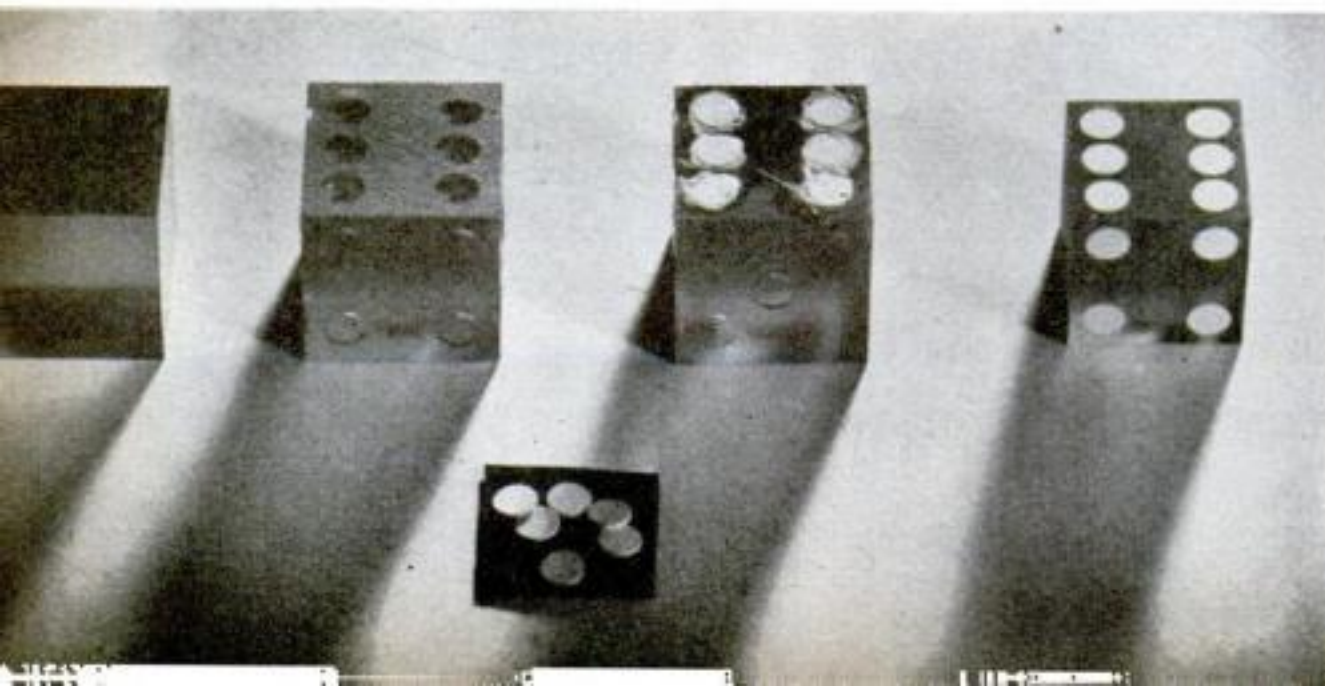
POINT	ODDS AGAINST
6 or 8	6 to 5
5 or 9	3 to 2
4 or 10	2 to 1

That makes it plain that anyone who makes a side bet at even money that the thrower will make his point is playing the

sucker. He should ask for the proper odds on each number. It is all very well to shout for Little Joe or Big Dick (a ten), but don't back either of them at more than one to two.

Those are the mathematics when you are dealing with straight dice and honest players. They do not take into consideration the various forms of loaded and shaped dice or sleight-of-hand throwing. The only way to avoid these hazards is not to play with strangers. Those who ought to know say the sharps take a lot of money away from the amateurs in the armed services. *Yank*, the Army Weekly, has carried a number of articles on this, revealing the tricks of the trade.

A crooked player who can control dice—



HOW DICE ARE MADE

A cube is cut on a machine with diamond-tipped cutters, and left to season for a month. Then cavities 6/1,000 of an inch deep are drilled, and plugs cemented into them. Machining makes the plugs flush with the surface. The perfect cube has a tolerance of only 1/20,000 of an inch.

THESE FOUR ENTERTAINING NEW DICE GAMES

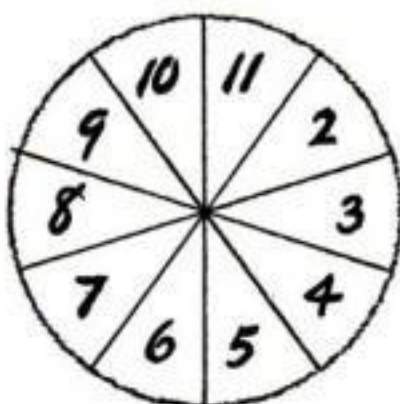
8	Out
9	1-base hit
10	2-base hit
11	3-base hit
12	Home run.

All men on base advance according to hits made. If desired, a diamond can be used with markers for men on base.

JACKPOT PIE

ANOTHER dice game, easy to learn, is played with a "pie" with cuts numbered as shown here:

Players roll two dice, each having one roll at a time. The player rolling a number places one chip on that corresponding piece of pie. When three chips have thus been placed on any piece, the next player to roll that number wins all three. Anyone rolling 12 (two sixes) takes all the money on all the pieces of pie. This game is from "At Ease!" by Jules Leopold (Whittlesey House, New York, 1943).



and this is a trick that can be acquired by long practice—does not worry about mathematics. He is no longer a gambler, but a sure-thing player. To amateurs it seems so difficult that they hardly suspect it when they are being fleeced by a sleight-of-hand artist. These sharps can pick up the bones, no matter in what position they lie, and shift them to the desired position in their hands. They can give them plenty of rattle without changing the position of the cubes, and then, with a fair degree of certainty, roll the desired number.

Bouncing the dice against a wall makes it far more difficult for these players, but some of them are said to be able to throw desired numbers that way, too.

There are various ways of loading dice by adding weight so that the heavy side will fall downward and give certain numbers more frequently than the odds call for. A popular fallacy is the belief that transparent dice cannot be loaded. The paint can be dug out of the holes drilled for spots, a light-colored metal put in, and the spots painted again.

Shaped dice of various kinds also are used by crooked players, giving them an unfair advantage by enabling them to know which numbers are (Continued on page 205)

BUNKO

THREE dice and any number of players. Cross marks are drawn on paper, three for each player, like this:

JONES X X X
SMITH X X X

Each player first rolls one die. The highest plays first. The lowest throws his die again to determine the trump. Assuming that four is trump, each time four appears it counts one point for the thrower. Five points cancel out one cross, as shown at the right:



The first player continues as long as he can roll at least one four to the cast. The first to cancel out his three crosses wins. If a player needs only one point to finish and rolls two or more trumps, he cannot score on that roll. He must score exactly what he needs to win.

Rolling three trumps at once wins immediately. Any other three of a kind scores five points, the same as five trumps.

THE ODDS AGAINST THROWING ANY GIVEN NUMBER WITH 2 DICE



"The Champ"

7 The odds are 6 to 1 against a player rolling a seven—"lucky" on first throw.



"Ada from Decatur"

6 or 8 Ada is not too hard to make—the odds against it being only 7.2 to 1. Same holds true for a six.

"Little Phoebe"



5 or 9 This lady is tougher. It's 9 to 1 against a five; and the same is true of a nine.

"Big Dick"



"Little Joe"

"Box Cars"



12 36 to 1, but not a point. Box Cars on first toss mean a loss.

4 or 10 It is 12 to 1 against Little Joe, Big Dick, and other fours or tens.

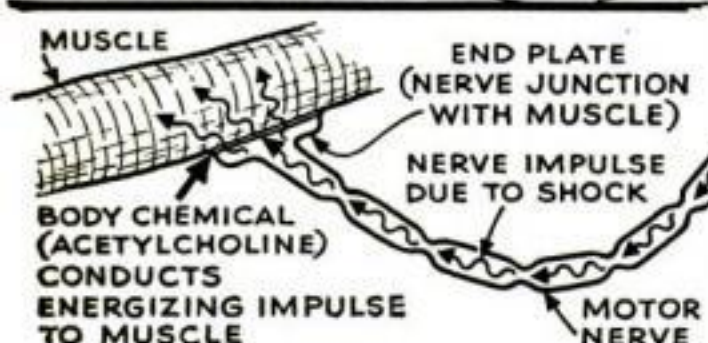
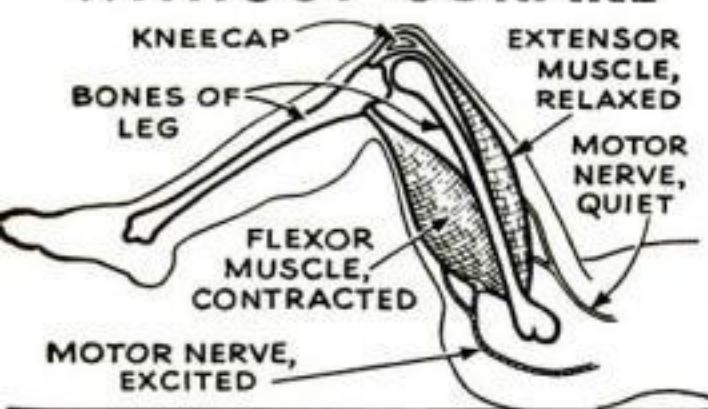
"Snake Eyes"



2 Same odds and results as with Box Cars. Nobody welcomes Snake Eyes.



WITHOUT CURARE



LEG DRAWN UP

Indian Dart Poison

CURARE, KILLER OF THE JUNGLE, ENLISTED

By **ROBERT E. MARTIN**

Drawings by STEWART ROUSE

SECRETLY, for centuries, the grotesquely clad witch doctors in the tropical jungles of South America have been taking the stems of certain woody, climbing vines and the bark and roots of other plants, performing mysterious ceremonies, and brewing a dark, gooey poison.

Into this, a hunter dips the point of a dart about a foot long and as slender as a matchstick. He then places this missile in a tube several feet long, made of the straight-

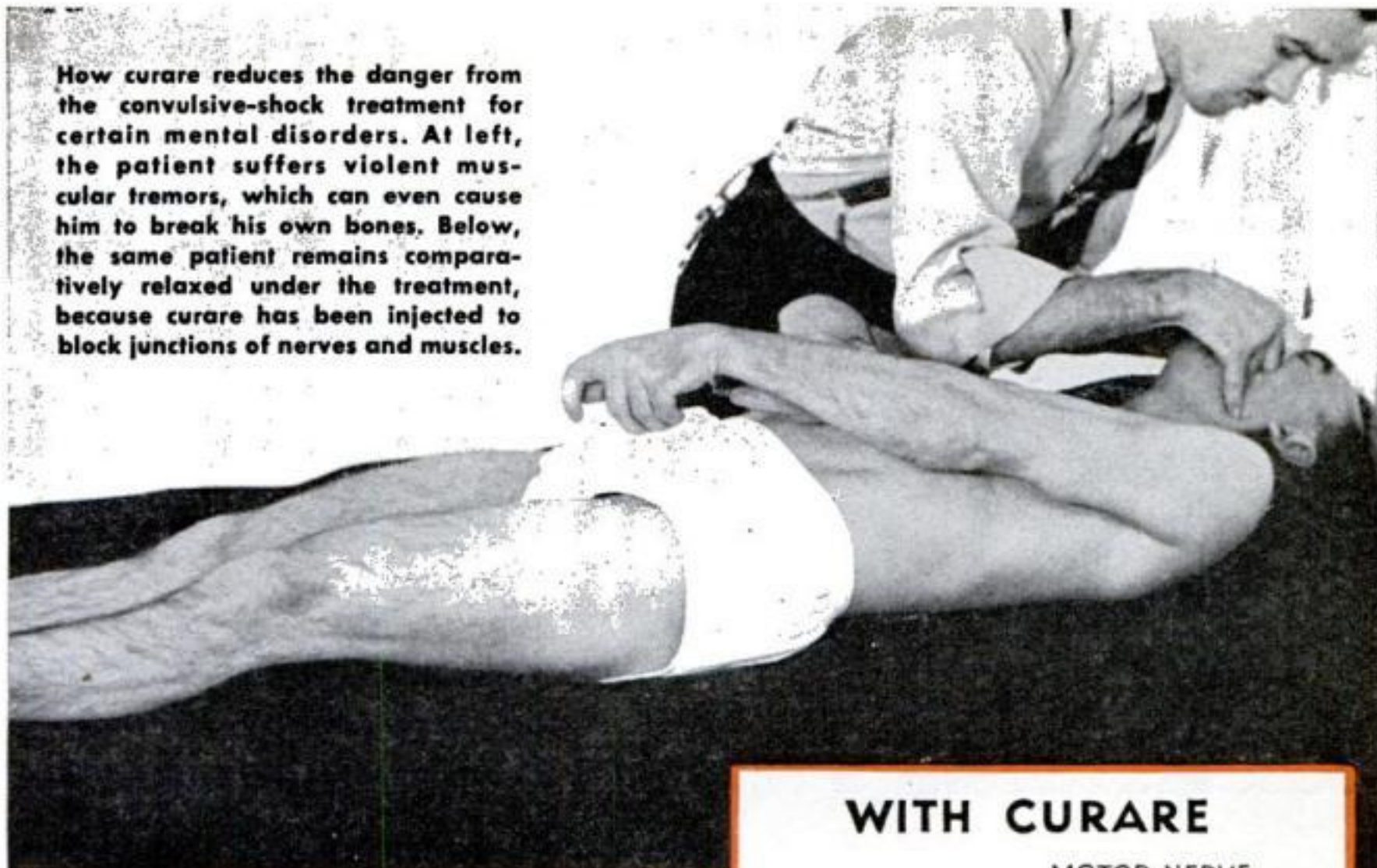
EXPLORER'S FALL FROM A HORSE STARTED THE LONG TREK

1 Richard C. Gill, jungle explorer, was thrown from his horse on a trail in the Upper Amazon. The jolt he received developed later into paralysis.

2 Recovering at home in the States, he learned the part the rare curare was playing in medical research of paralysis. In 1938 he returned to the jungle, where his Indian friends taught him how to brew the deadly concoction. Months later, he brought home a huge supply.



How curare reduces the danger from the convulsive-shock treatment for certain mental disorders. At left, the patient suffers violent muscular tremors, which can even cause him to break his own bones. Below, the same patient remains comparatively relaxed under the treatment, because curare has been injected to block junctions of nerves and muscles.



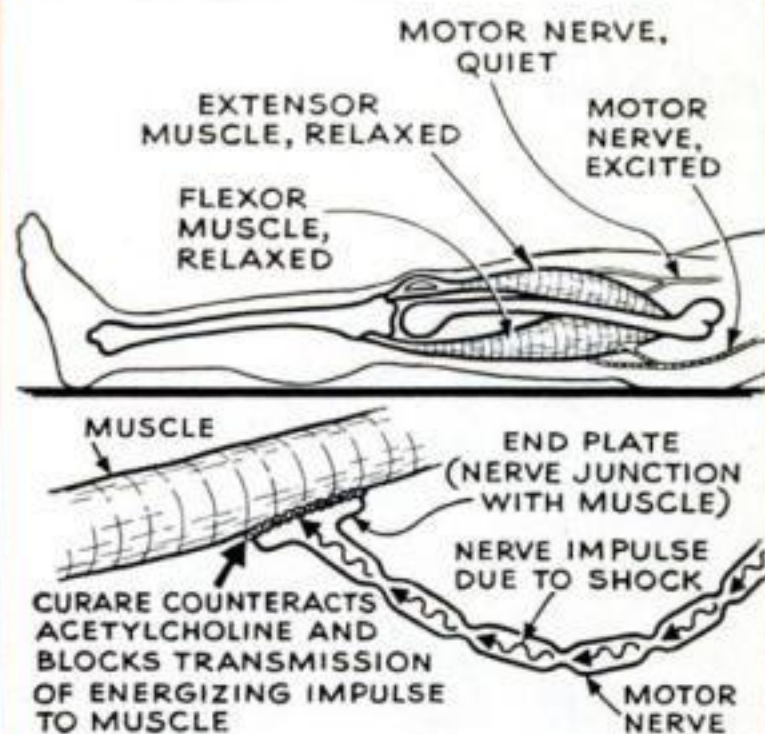
Saves Lives

BY MEDICAL SCIENCE

grained wood of the chonta palm. By holding this pipe to his lips and blowing, he can kill a jaguar nearly 50 yards away.

There is no sound. The dart need only pierce the hide of the game. Then, as the poison races through the blood stream of the beast, bird, or monkey that is hit, the muscles of the neck, the limbs, the abdomen, and the respiratory system are paralyzed. Death is certain, regardless of where the

WITH CURARE



LEG RELAXED

TO GIVE DOCTORS A NEW WEAPON IN THE WAR ON DISEASE

3 Medical scientists purified and standardized the dart poison by tests on laboratory animals. Dr. A. E. Bennett, aided by Dr. A. R. McIntyre, introduced it successfully in convulsive-shock therapy.

4 Now, not only is the "black magic" making safe the shock treatment of mental disorders, but its relaxing effect renders a paralysis victim responsive to the various phases of muscle re-education.





(Photo by R. C. Gill, courtesy Henry Holt & Co.)

INDIAN DART BLOWER can kill a jaguar at 50 yards with a curare-tipped arrow. Poison brings death instantly, but animal's flesh remains edible.



CURARE, applied to arrowheads, is a heavy, gummy, dark-brown paste, which, in the jungle, is made only according to strict ritual. Prepared for clinical use as a lifesaving drug, it resembles weak coffee.

thin, light projectile strikes the animal. Yet the flesh is not contaminated. The hunter can eat his game without fear.

Now this same strange poison is being used by American physicians and surgeons. With its help, they are treating children afflicted with dreadful maladies, performing delicate operations successfully—and speeding the restoration of crazed persons to sanity!

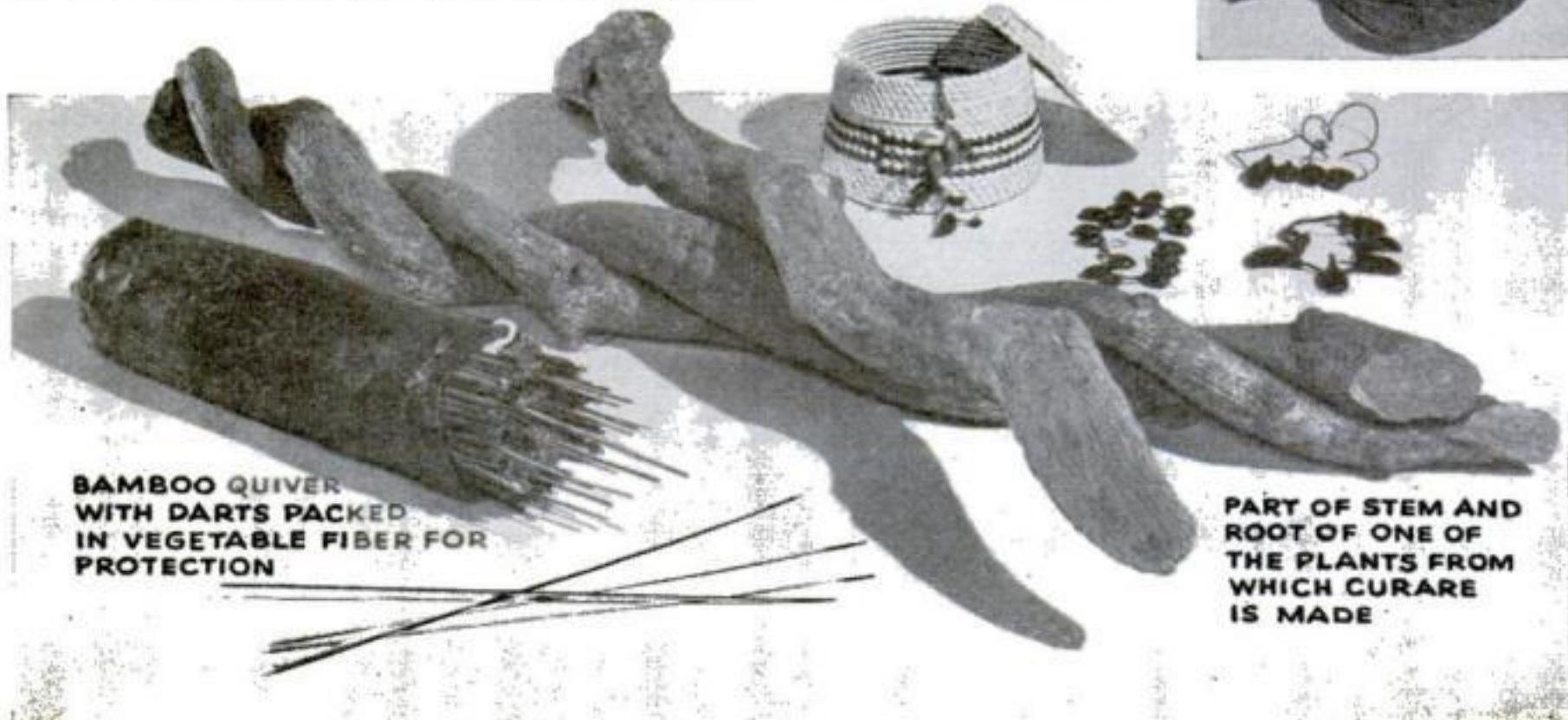
How this came about is a story almost as incredible as the tales of Baron Munchausen. But this yarn is substantiated by the solemn, scholarly, statistical reports of distinguished men of science in their professional journals and the case histories of thousands of patients who have been treated with curare (pronounced "koo-RAH-ray").

Sir Walter Raleigh obtained samples of this poison from the Orinoco Indians in the sixteenth century. Laboratory research was undertaken and the Indian hunters' poison was tried in the treatment of some diseases in the nineteenth century. But the supply was limited, uneven in quality, and often contaminated. Hence, until recently, the jungle witch doctors retained their monopoly of the use of curare.

Richard C. Gill, a jungle explorer since 1930, won the friendship of some of these primitive people in Ecuador and took lessons in witchcraft from them. As an accredited witch doctor, he was finally permitted to hear the incantations and see the ritualistic boiling and filtering of plant materials from which they produced curare. He dined on curare-killed birds and beasts with the copper-skinned hunters.

Even so, Gill did not realize how helpful this poison could be in civilized countries until, some time later, he was injured in a fall from a horse. (Continued on page 204)

INGREDIENTS of curare, some of which are shown below and at right, vary among the Indian tribes, as does the technique of making it. The container and trinkets are of Indian handiwork.

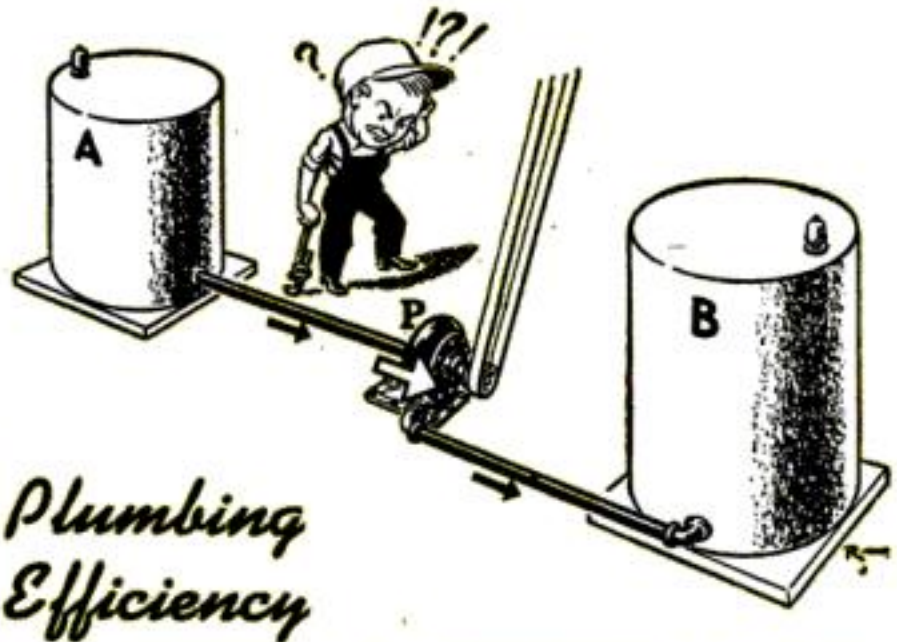


BAMBOO QUIVER WITH DARTS PACKED IN VEGETABLE FIBER FOR PROTECTION

PART OF STEM AND ROOT OF ONE OF THE PLANTS FROM WHICH CURARE IS MADE

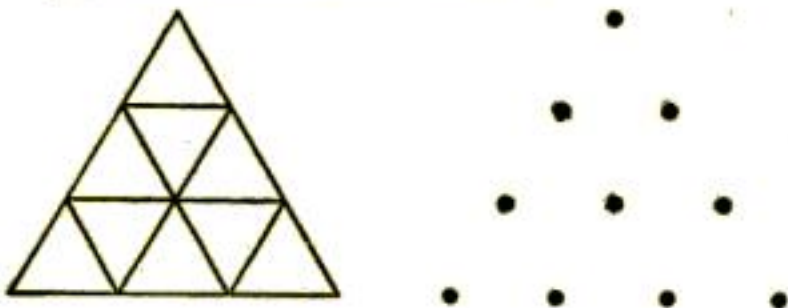
Five Brain Teasers

CLEAR thinking and plenty of patience will solve any or all of the puzzles by Dr. Harry Langman on this page. You'll have something to shout about, though, if you can get four out of five, and you're pretty good if you can solve only one or two. Here is just a hint about squaring Grandma's remnant: it doesn't have to be cut entirely along the lines shown. You will find the solutions on page 205.



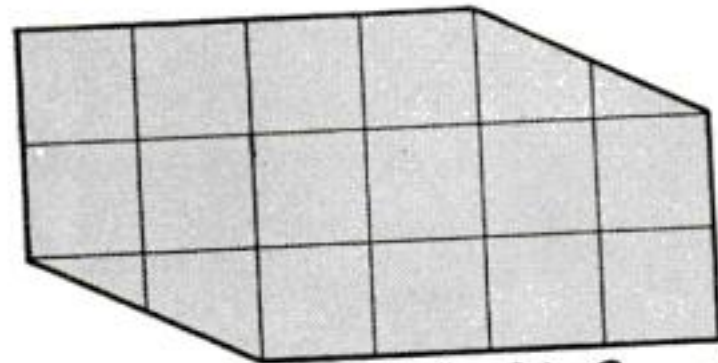
Plumbing Efficiency

THE setup of the rotary pump, P, will carry oil from tank A to tank B. If you had to reverse the direction of flow between the tanks for part of the time, how could you connect valves to the system so that you could pump oil in either direction, from A to B or from B to A?



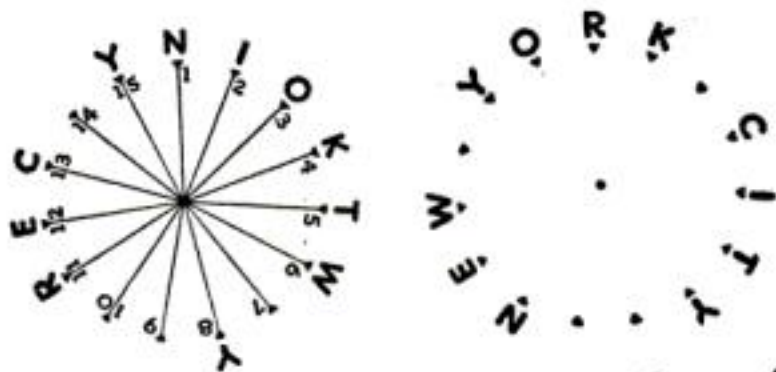
For Triangle Counters

HERE are two problems to sharpen your wits on. In the left-hand figure, how many distinct, completed triangles can be counted? This isn't too hard, but look out for the arrangement at the right; it is for testing your ability to discover how many separate triangles there are, having for their vertices three of the ten dots. Hint: there are more than in the first figure.



Grandma Did It Easily

HOW did Grandma cut this remnant in two pieces so that, when they were sewed together, formed a perfect square?

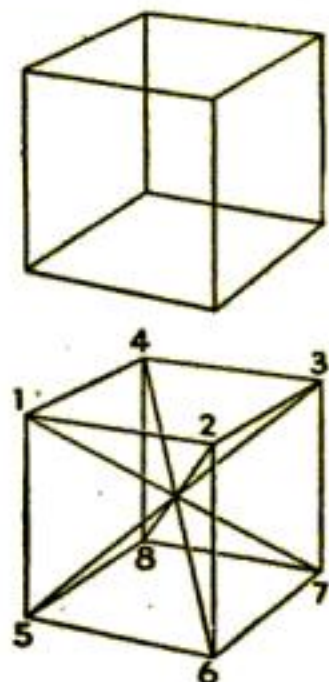


Unscrambling New York

SHIFT the letters (left) to order shown at right in fewest possible moves. A move 5-14 means that T has been moved to vacant 14 space.

Wired Cubes

STRETCH wire to form a cube (top figure). If each edge consists of a single strand, find the smallest number of pieces needed to complete the cube. If "solid diagonals" are also included (right), how few pieces will serve?





U.S.S. COOPER added a new chapter to the proud history of American destroyers before she went down with her guns blazing off Leyte in the Philippines on the night of December 2-3. Blocking the reinforcement of the Japs through the port of Ormoc, she beat off three aerial attacks, shooting down one or two enemy planes. Then she sank a big Jap destroyer and a warship of destroyer-escort size before a torpedo hit and split her.

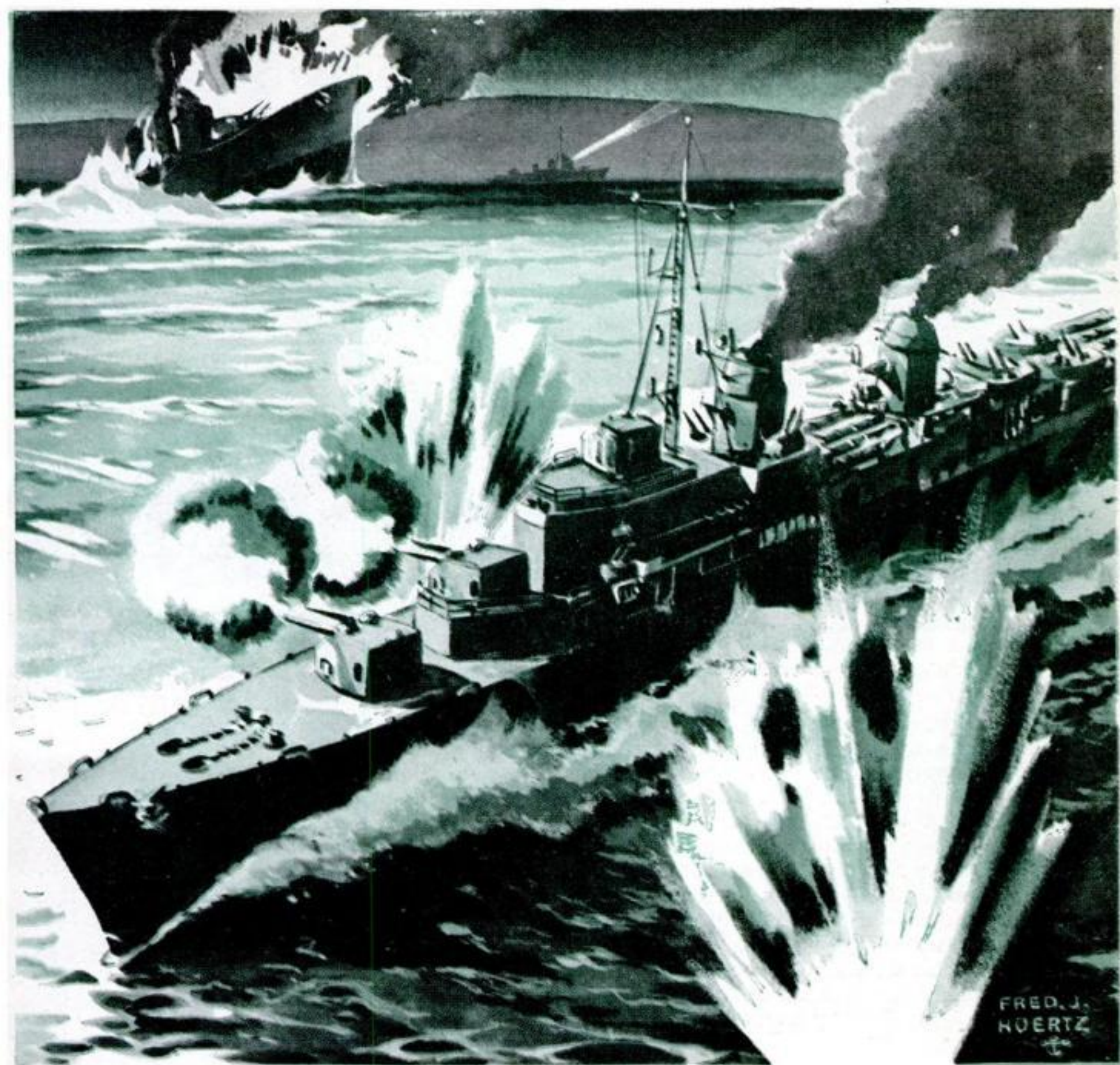
"Tin Cans" Dish It Out!

Back in 1877, naval experts were worried about torpedo boats. The answer was the destroyer—now one of the most useful tools of seapower.

By **ALDEN P. ARMAGNAC**

SCRAPPIEST of warcraft, they stand up to anything afloat, including battleships. Ton for ton, they outgun all other men-of-war. On the same basis, the propelling machinery that gives them their dashing speed is the most powerful. High seas inundate their decks, they roll until masts stand mid-

way between sky and water, and sandwiches are stormy-weather fare until pots and pans will stay put on galley stoves. They are about the largest warships whose men all know each other by first names. Crews openly blast with seafaring language, but secretly love, these sailors' ships that laymen call destroyers, that the Navy Department lists as DD's, and that will always be



known to the men aboard them as tin cans.

A destroyer of our 2,100-ton *Fletcher* class, last on which details are available, illustrates what a modern destroyer fights with. Five double-purpose guns of five-inch caliber shell surface craft, or may be elevated to fire on planes. Antiaircraft guns of 40-mm. and 20-mm. size provide additional firepower. Also double-purpose, the AA's can be depressed to riddle surfaced submarines. Two deck-mounted sets of torpedo tubes, five in each mount, invite healthy respect from enemy warships. Depth charges dispose of submarines under water. Though our latest and heaviest destroyers of the 2,200-ton *Allen M. Sumner* class remain pretty much under wraps, it may be said that increased armament principally accounts for their greater tonnage.

From its guns alone, a *Sumner*-class destroyer throws more than a ton of steel in only 15 seconds, as Japanese warcraft have already learned to their dismay.

As might be suspected from its variety of weapons, a destroyer performs countless missions. Supporting amphibious landings, naval opinion holds, represents the outstanding innovation among destroyer uses during World War II. Based on such successful tests as the Normandy invasion, in which 30 U. S. tin cans participated, the procedure begins with a preliminary long-range bombardment by battleships and cruisers. This reduces to rubble the massive fortifications that only their heavy shells can penetrate.

Now comes the destroyers' turn. Able to maneuver in shallow and constricted waters, they steam close to shore, to locate and put



Y GUNS (right) toss depth charges far out on both sides to crush lurking submarines. Above, an "ash can" hurls up a geyser of water as it explodes.



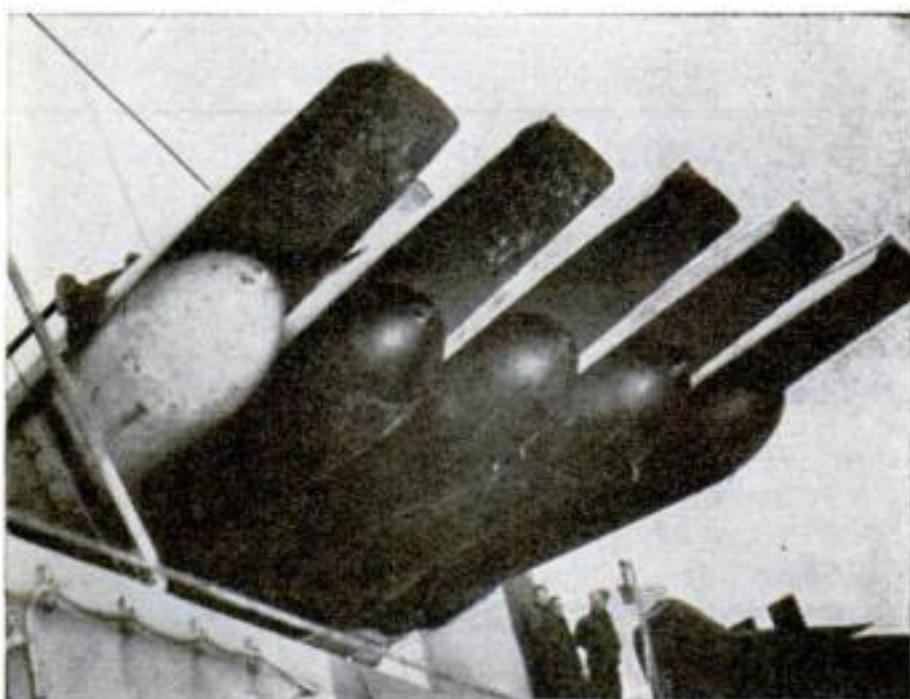
out of action all remaining gun positions commanding the intended beachhead. Of course, this is simply throwing the rule book overboard, for a square hit from a six-inch shore battery can demolish a destroyer—which has no armor worth mentioning—as thoroughly as a salvo from a battleship's big guns. But when the fate of a great invading army hangs in the balance, destroyers become expendable. It cost us the destroyers *Meredith* and *Glennon* to put our troops ashore at "Utah Beach" in Normandy, a price well justified by the success of

the landing and the enormous over-all saving in casualties.

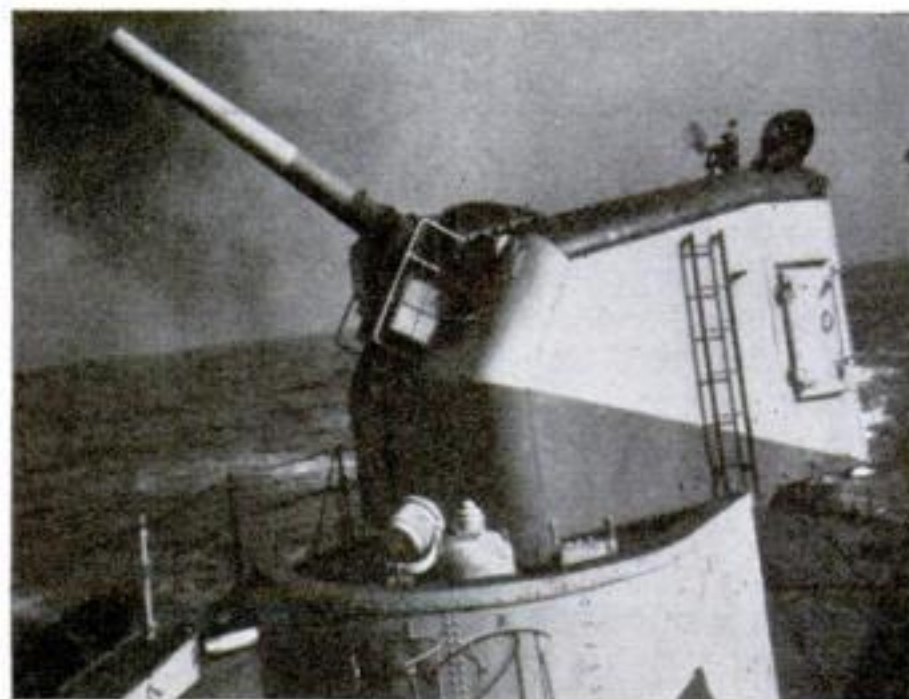
No heavy warship, fleet, or convoy would dream of leaving port in wartime without an escort of destroyers to "screen" it from attack, especially by enemy submarines. Task forces of destroyers also hunt submarines on their own. The team which destroyed more submarines than any other in naval history consisted of the four-stacker destroyers *Borie*, *Barry*, and *Goff*, operating with the escort carrier *Card*.

One stormy night in the North Atlantic,

TORPEDOES are fired by "impulse charges" from multiple tubes that are aimed like guns. The white "fish" below is a dummy; others are real war heads.



FIVE-INCH GUNS of main battery can be used against subs, surface craft, or planes. Mounts are protected against shrapnel, but are not armored.



THE DESTROYER'S WEAPONS



20-MM. OERLIKONS guard the destroyer against low-flying enemy planes. Independently controlled, they fire tracer shells at intervals for correcting the aim.



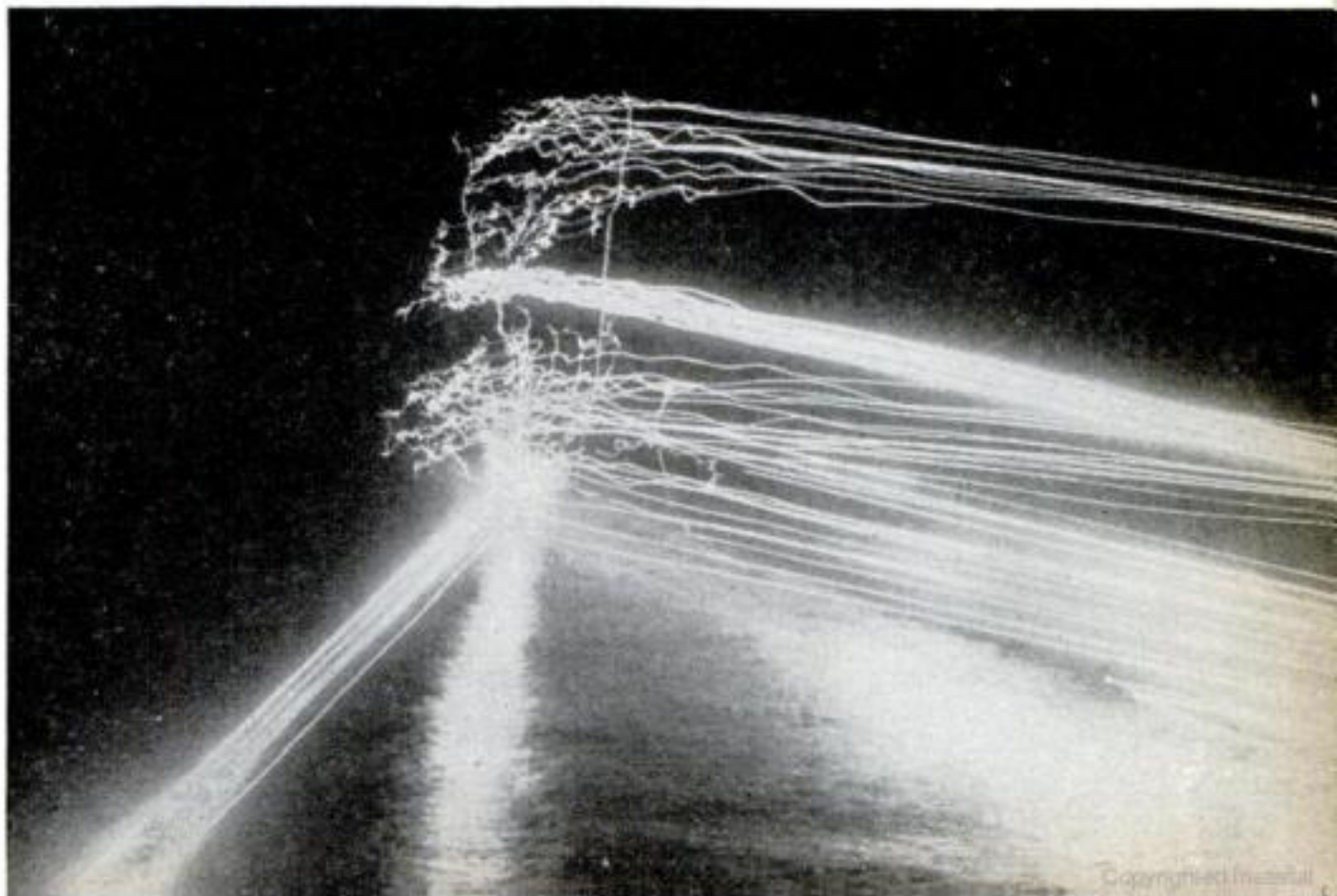
the *Borie* spotted a U-boat, which crash-dived. Depth charges brought it back to the surface, and the *Borie* rammed it. Freeing itself, the sturdy submarine attempted to torpedo the destroyer. But a well-placed shell from the *Borie* carried away the U-boat's conning tower and ended the battle. The stern of the submarine tilted skyward, and it nose-dived to the bottom. Severely damaged in the encounter, the destroyer stayed afloat only long enough for another ship to rescue nearly all of her crew. In memory of her valiant fight, her name has been reassigned to one of our newest super-destroyers.

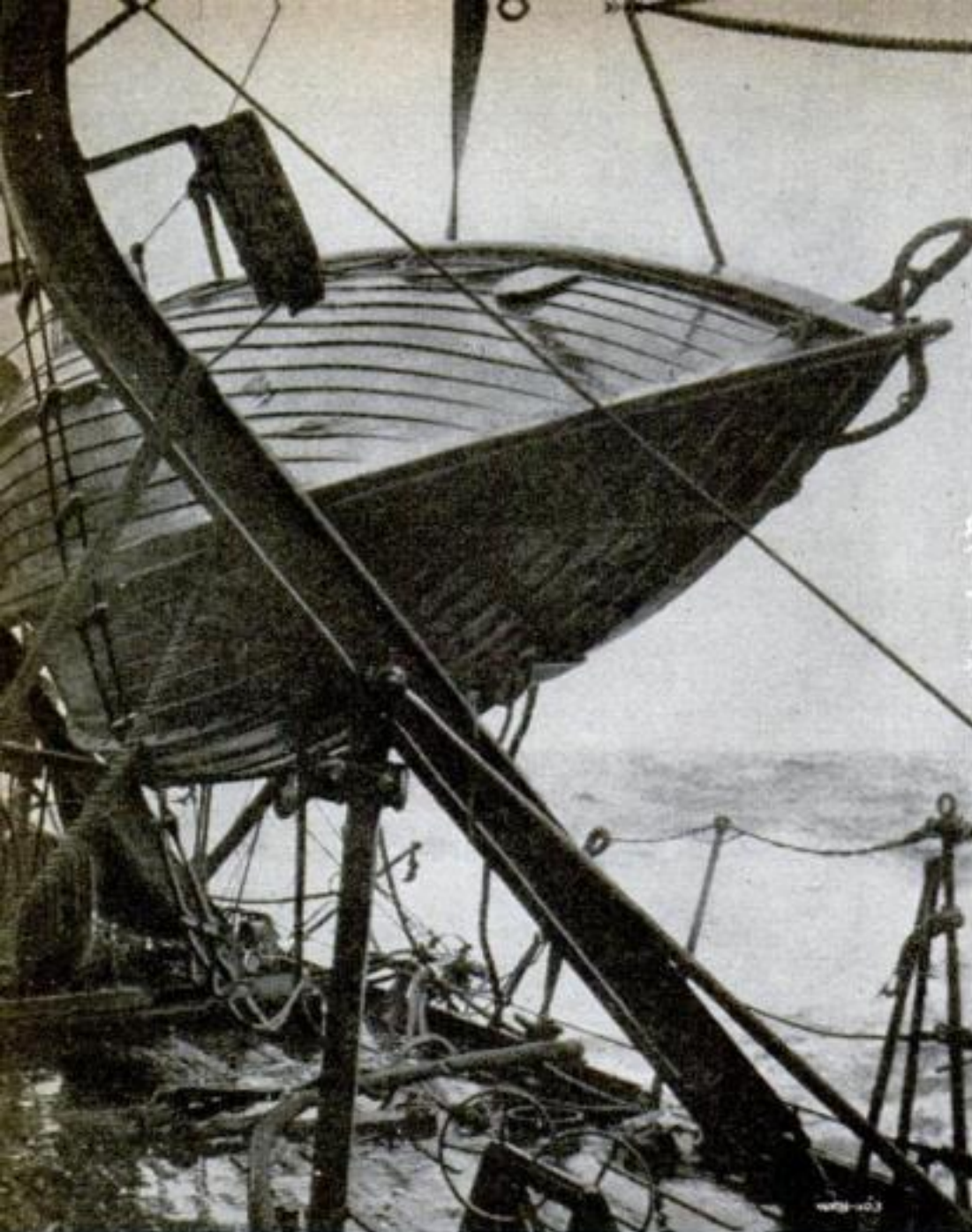
Laying a smoke screen—an important destroyer mission—contributed to the



40-MM. BOFORS guns in twin mounts are dual-purpose weapons, used against planes and warships.

TRACERS weave a deadly web around a Japanese barge in a night battle off Vella Lavella Island in the Pacific. American destroyers helped block an enemy attempt to land new troops under warship escort. By night or day, tracers show gunners whether shells are finding their mark.





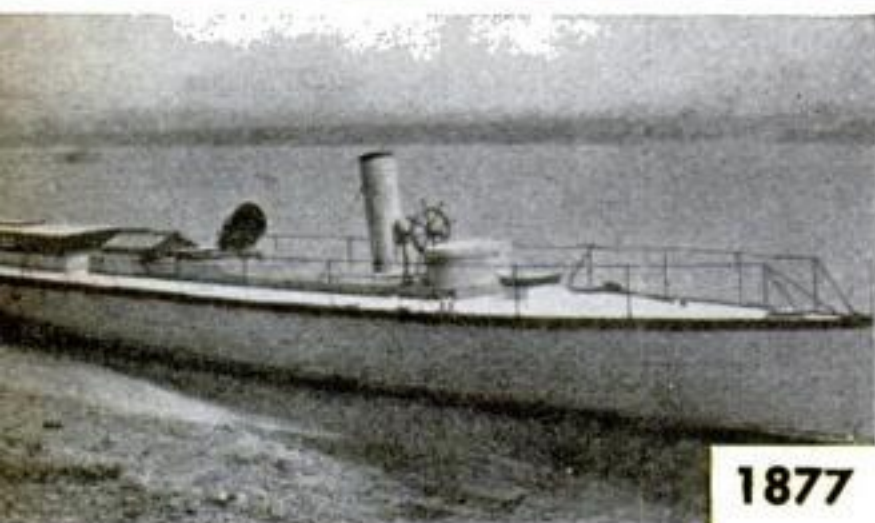
STORMY WEATHER often pounds destroyers as mercilessly as the enemy. This Canadian vessel bears the scars of winter gales encountered on Atlantic convoy duty. Sea-boats were stove in, stores flooded, below-decks awash.

smashing American naval victory in the Second Battle of the Philippines, now officially renamed the Battle for Leyte Gulf. When a powerful Japanese fleet made a surprise sortie from the central channel, guarded only by our light carriers and destroyers, the tin cans raced between the opposing forces, billowing dense smoke. Two of them, the *Hoel* and the *Johnston*, failed to come back. But under their cover, the carriers were able to launch their planes, and, having done all they could, to retire until American reinforcements put the bomb-battered Japs to flight.

In a full-dress fleet action, normally covering a vast expanse of sea, destroyers do the infighting—attacking enemy destroyers, cruisers, and battleships as they charge across the distance between the majestic lines of big vessels. Two of our own major naval engagements—the Battle of Guadalcanal and the Battle for Leyte Gulf—gave our destroyers their chance against battleships, though the narrow waters in which they took place turned stately maneuvers into wild melees.

Lasting only 24 minutes, the midnight Battle of Guadalcanal has been termed by Fleet Admiral

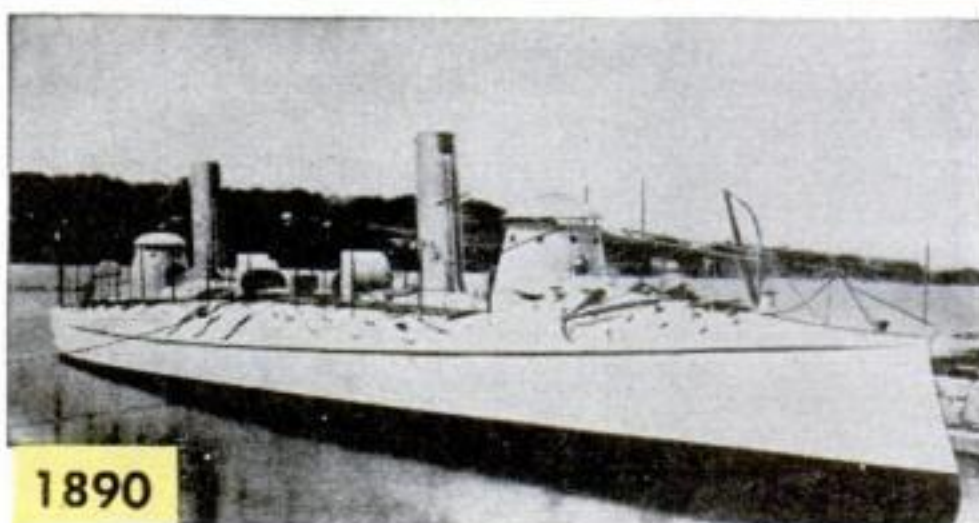
HOW THE DESTROYER GREW: AT FIRST A COUNTERWEAPON,



1877

First torpedo boat designed to use the Whitehead self-propelled torpedo was H.M.S. Lightning. Her steam engine gave her a speed of about 19 knots.

Only U.S. destroyer sunk by enemy action in World War I, the Jacob Jones (below) belonged to the 1,050-ton Conyngham class, our first oil-burners.



1890

U.S.S. Cushing was our Navy's first "modern" torpedo boat. Rated top ship in her class, she was 139 feet long, did 22½ knots with her compound steam engine.

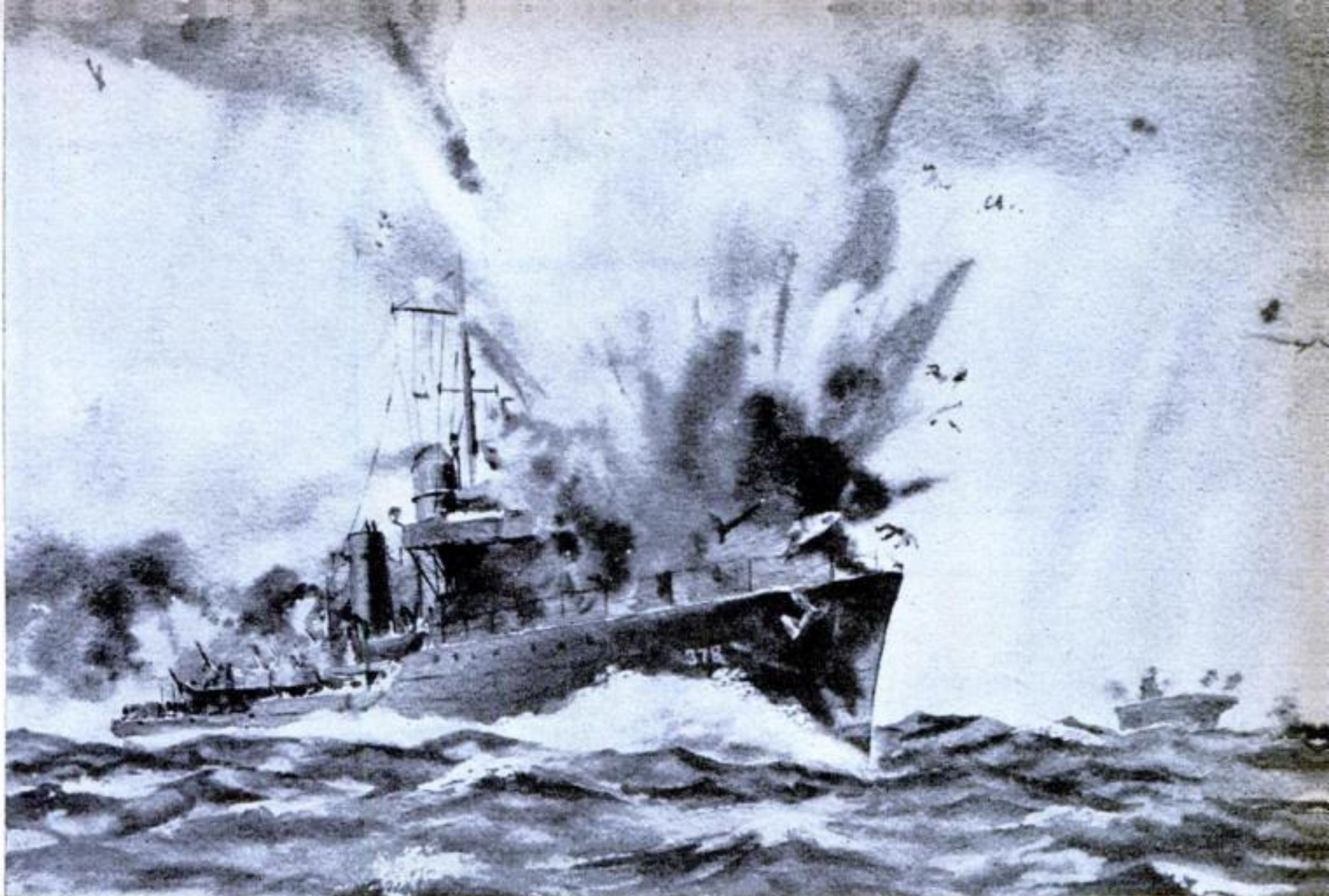
Our first destroyers after World War I were ships of the new Farragut class. About 1,400 tons, 334 feet long, 36 knots. Had five 5-inch, four 40-mm. guns.



1915

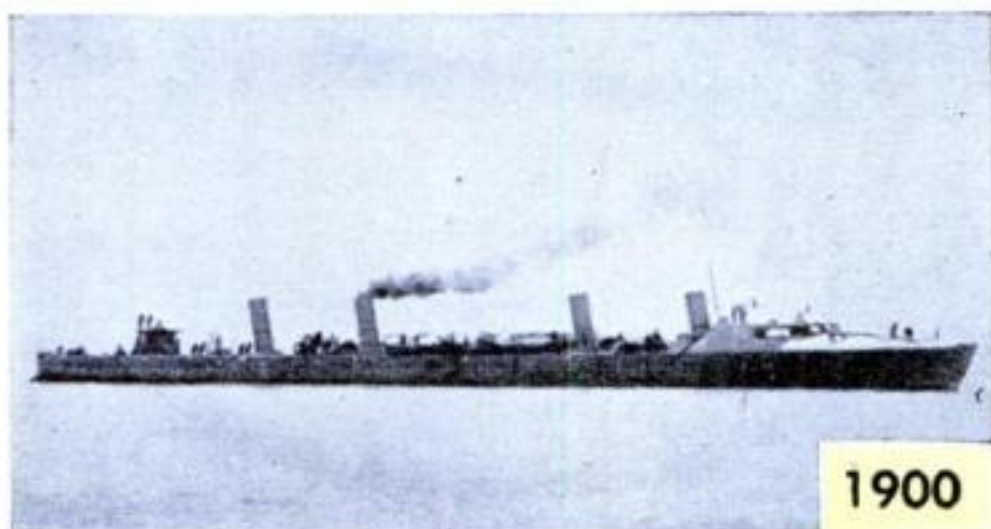


1935



SHE FOUGHT ON! One of the bravest performances in American naval history is pictured in this water color by Lt. Dwight C. Shepler, USNR. In the Santa Cruz battle, October 26, 1942, a flaming Jap torpedo plane crashed on the forecastle of a U. S. destroyer. Ammunition stowed on deck went up in a terrific explosion, but the gallant ship kept station and never stopped firing while the blaze was put out.

IT HAS GAINED IN SIZE AND POWER WITH NEW DUTIES



1900

Then came the "torpedo-boat destroyer," pioneered by the British Havock and American Farragut. Above is a ship of our Truxton class: 435 tons; speed, 30 knots.

Last U. S. prewar type was the Benson class—341 feet long, 1,630 tons, 39 knots. Armament (before Pearl Harbor) consisted of five 5-inch, four 1.1-inch guns.



1909

U. S. destroyers took on steam turbines and three-inch guns with the Flusser class. Their powerful engines gave these 700-tonners a 30½-knot speed.

U.S.S. Cotten, below, is typical of the destroyers built since the beginning of the war. These ships keep getting bigger, faster, and deadlier.

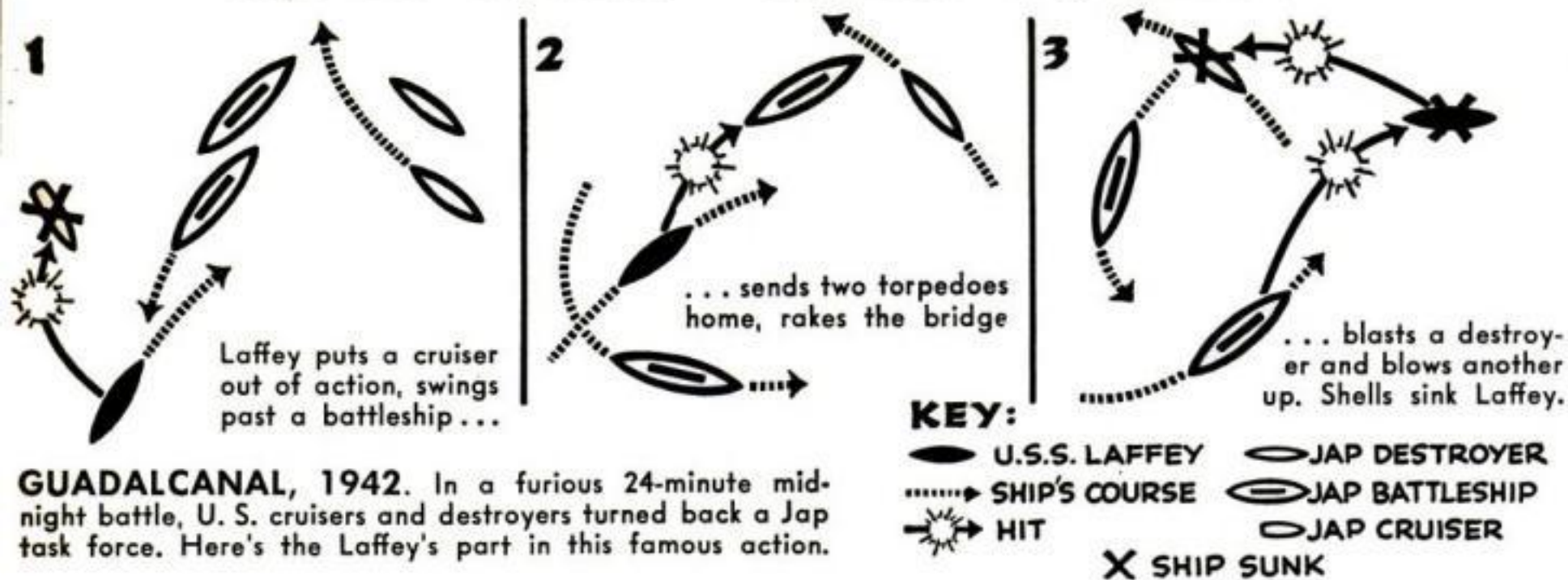


1940



1944

BATTLE TACTICS ★ DESTROYER LAFFEY



Ernest J. King one of the most furious sea actions in history. In that time, an out-matched American force of five cruisers and eight destroyers repulsed a Japanese task force of two battleships and 16 other war-craft bent on recapturing the island from American invaders. "We want the big ones," radioed the American commander, Rear Admiral Daniel J. Callaghan. So the destroyer *Laffey*, having put a Jap cruiser out of action, fired two torpedoes into a battleship—and then, cutting past its bow, raked it with gunfire and blew off its bridge. Unable to depress its guns, the Jap had no reply to this American impudence until the *Laffey* put one destroyer out of commission, blew up another, and then was sunk by battleship fire. Meanwhile several other U. S. destroyers scored torpedo hits on battleships, the *O'Bannon* being credited with three.

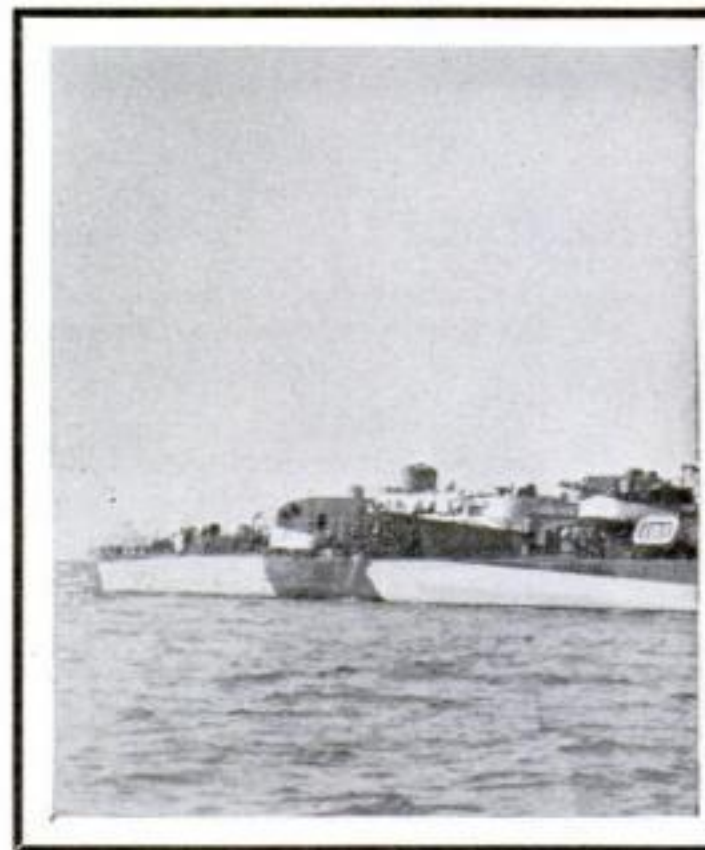
It was also before daybreak when a Japanese force headed by two battleships attempted to traverse the southernmost channel through the Philippines, in the

three-ring Battle for Leyte Gulf, last October. At this point, Vice Admiral J. B. Oldendorf was ready for them. Since the narrow channel of Surigao Strait gave him little room to deploy his destroyers, he lined them up along the shore, backing up this advance force with cruisers and battleships. Steaming squarely into the trap, the Japanese vessels suffered three co-ordinated destroyer attacks with torpedoes, and salvos from our heavy ships then finished off the two Japanese battleships and virtually the entire contingent.

Just how a destroyer aims and fires its torpedoes, by the way, makes an interesting contrast with undersea boats. Submarines discharge them under water, with compressed air. But it takes more than a whiff of breeze to toss overboard a Mark 15 destroyer torpedo, more than 20 feet long and weighing 3,400 pounds with its war head of TNT. So the torpedo gets its start from an "impulse charge" of black powder.

Sitting astride a bank of tubes, a torpedo-man's mate re- [\(Continued on page 203\)](#)

Deck and superstructure reflect the flash of the guns as a "tin can" hammers enemy ships in the night battle off Vella Lavella (page 131).



POPULAR SCIENCE



HEALTH. In the tiny sick bay, the ship's doctor (a lieutenant), aided by pharmacist's mates, examines ailing crewmen and dispenses medicines.



WORK includes packing precious brass shell cases from the five-inch guns into aluminum containers. They are shipped back home to be loaded up again.

CHOW comes from a spotless galley run by about 10 men. These pork chops reached the chef frozen solid. When one meal is finished, next is started.



REST. Crew's quarters have triple-deck bunks with fireproof mattress covers. Men often eat off trays in their bunks, as messroom holds only about 35.



SUPER - DESTROYER.

Ships of our Allen M. Sumner class, such as the Cooper (left), are so big and powerful that in the last war they would have been classed as cruisers. Much of the great weight (2,200 tons) went into increased armament. The guns can throw over a ton of steel in 15 minutes.

What's New in Modern Living



JUST RELAX, and this chair relaxes with you. Invented by Lloyd Melleski, of Miami Beach, Fla., the beach chair shown above assumes and holds any position from up-

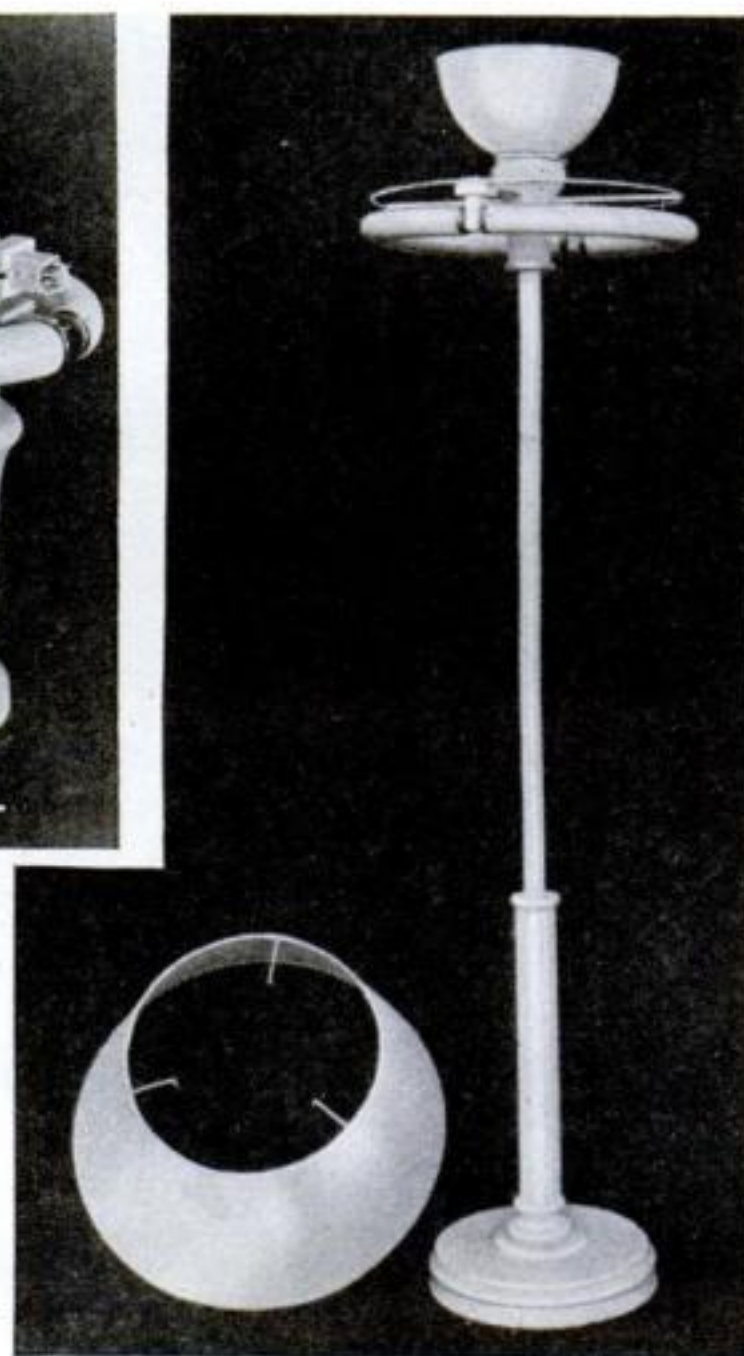
right to prone in response to pressure exerted by the user. Melleski has offered it to military hospitals. Actress Ann Sheridan shows how it's used.



DARK ROADS are safer for pedestrians who carry a lantern flashlight, above. The case is made of red lucite and glows brightly when the light is on. It can be held by an end loop, so that while the flashlight illuminates the ground, the luminous body acts as a taillight.

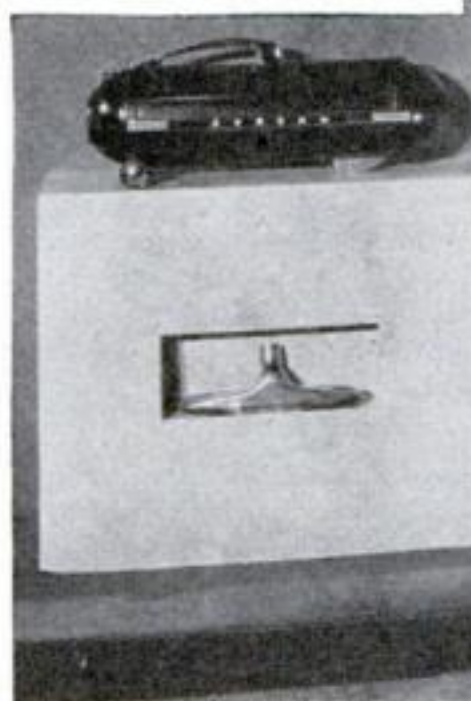


CIRCULAR fluorescent tubes have been designed by several manufacturers to meet the expected demand for portable lamp fixtures, according to the Illuminating Engineering Society. Like the straight tubes, these require ballasts.

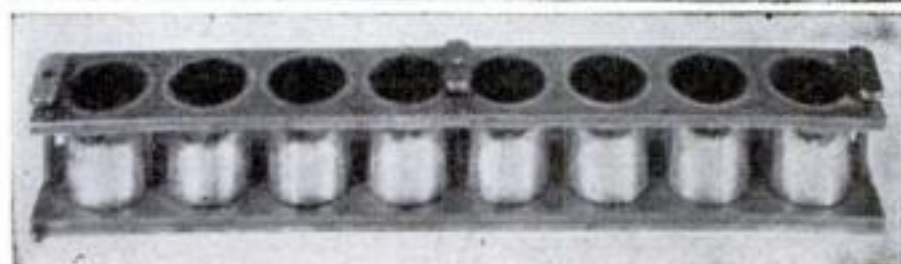
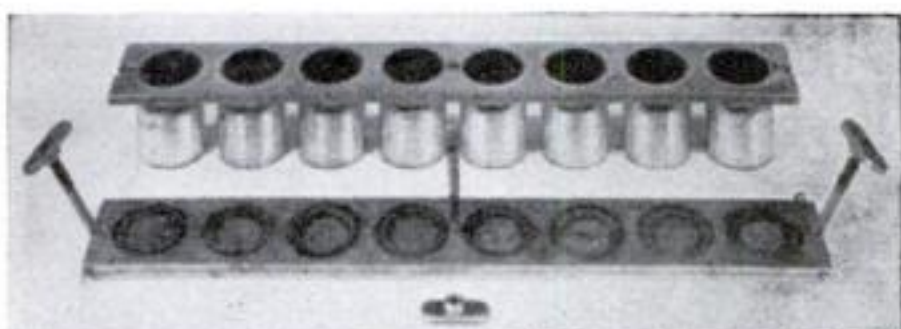




CELLAR TO ATTIC cleaning is projected for this combination vacuum cleaner soon to be put into production by the Eureka Vacuum Cleaner Co. It consists of an upright unit, a tank unit, and interchangeable attachments.



SWISH the soap saver for a tub of suds. The cylinder is packed with scraps of soap too small to be used by themselves. The device is made by the R-System Co., of Chicago.



ICE TUBES instead of cubes are formed by this freezing tray invented by Roy M. Cummins, of Akron, O. Used in a refrigerator, the tray turns out perfectly formed cylinders that can be dropped into vacuum bottles without being chipped or melted down to size.



WATCH-POCKET WALLETS, measuring only 2¼" by 3⅞", are being made by the Arel Photo Supply Co., of St. Louis, Mo. Unfolded three ways, the billfold is just large enough to hold paper money; it has a coin purse and a transparent window for identification cards.



SPOTS AND STAINS can be rubbed out of fabrics with a compressed-powder eraser made by the Duncan MacKenzie Co., of New York. The chemical in the stick reacts upon the stain within a few minutes. It is dry and odorless, and is said to be harmless to colors and fabrics. Greasy spots in particular can be treated with this cleaner.

Gus Turns High-Pressure Salesman

By MARTIN BUNN

"HELLO, Mis-tair Veel-son!" Gus Wilson looked up from his workbench toward the Model Garage shop door where a bright, spring sun revealed a squat, dark figure in stained clothes. The visitor took off a floppy hat and, with an exaggerated gesture, swept it to the floor as he bowed low. Then he advanced into the shop, teeth gleaming white in an ingratiating smile under a long black mustache.

"Oh, hello, Tony," Gus said, returning the greeting with little cordiality. "So spring's here. When you gypsies show up, that makes it official. What did you come in for—to bring back that monkey wrench you snatched the last time you were here?"

Tony's swarthy features registered bland innocence. "Moonkey ranch?" he asked. "What ees a moonkey ranch?"

Gus shrugged. "Well, what do you want now?" he demanded.

Tony edged up to the bench, and Gus saw a covetous gleam in his dark eyes as his glance ranged over the tools on it. "I come to buy a bat-tair-ree, Mis-tair Veel-son," he said. "Mine, he go flooey all the vay from Sout' Car'lina." A grimy hand moved stealthily toward a peening hammer. "You got goot bat-tair-rees, Mis-tair Veel-son?"

"Get your mitts off that bench, and keep 'em off. See?" Gus snapped. "Batteries? Sure, we've got swell batteries. You go into the office and pay Mr. Clark 14 bucks, and I'll put one in your bus."

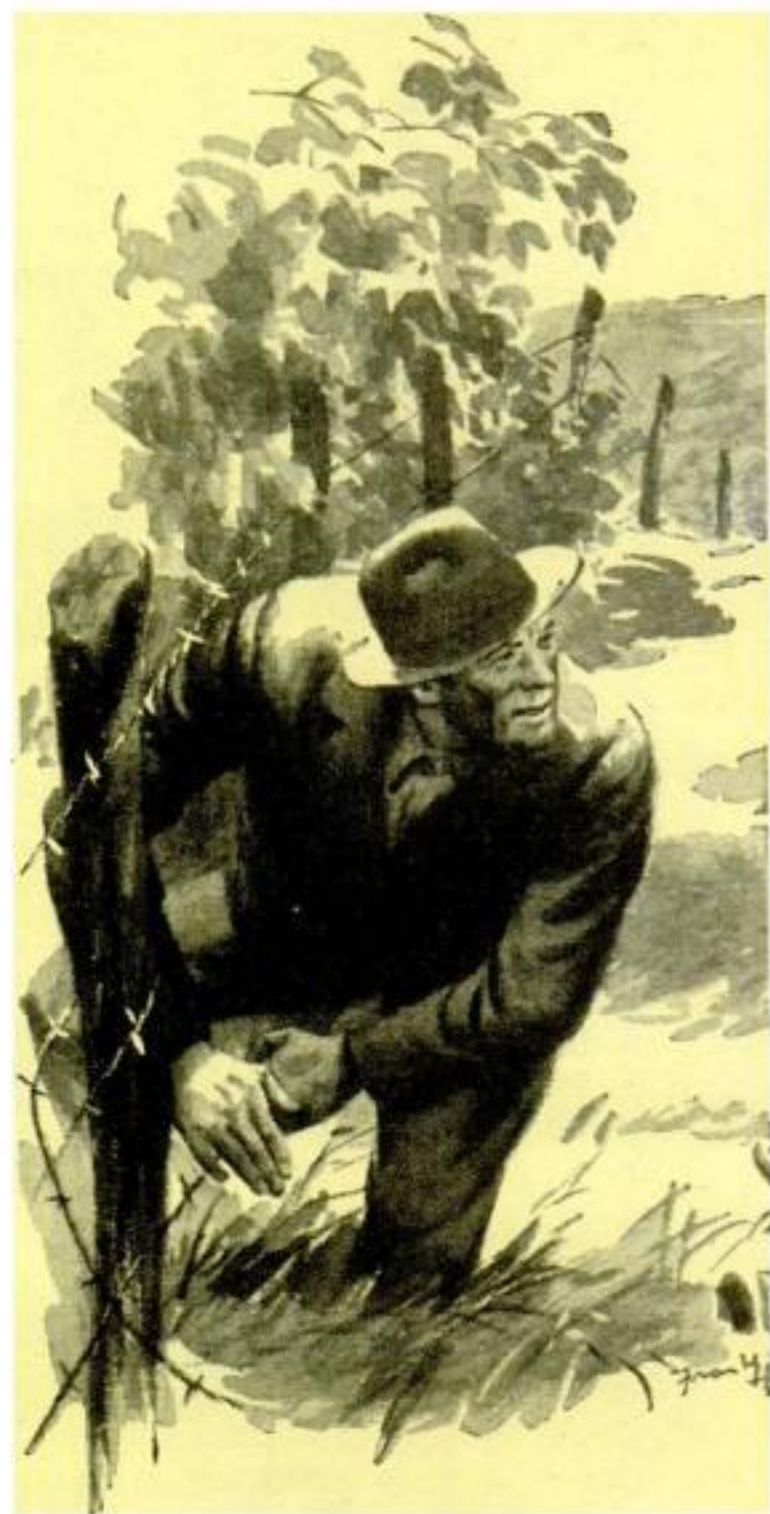
"You put heem in," Tony suggested, "an' I pay you five dol-lair now an' the rest tomorrow. Ho-kay, Mis-tair Veel-son?"

"Scram," Gus laughed. "I'm busy."

Tony was silent for a moment. Then he tried again. "Mis-tair Veel-son, you sell a five dol-lair bat-tair-ree? Ho-kay?"

"We haven't any secondhand batteries," Gus told him with finality.

Tony went into a lengthy lamentation about the trouble he was having with his



worn-out battery. It was interrupted by the appearance of Joe Clark, who glared when he recognized the gypsy.

"Get out of here," Joe yelled. "Last year you thieving gypsies swiped a box of spark plugs and an inner tube. Get a move on! Beat it, or I'll call the cops."

Tony saw the game was up, and he made a complaining but hasty retreat.

Joe turned to Gus. "Jerry Corcoran just phoned," he told his partner. "He wanted to remind you that the trout season opens tomorrow and suggested that you take the morning off and go to Brawley Brook with him. He doesn't have to report to the State Police Barracks until afternoon. Well, what do you say? It will do you good. Shall I call back and say you'll go?"

Gus went into a long speech about why he couldn't go—too much work to be done in the shop, the water too cold for trout to take a fly, and, as a clincher, too many fishermen on opening day.

Joe laughed at him. "You say all that every year," he pointed out, "and every year you wind up by going. I'll tell him



From the top of the ridge they saw a man lift something out of Gus's car and put it in another parked alongside.

you'll be along tomorrow morning—as usual."

"Oh, all right," Gus weakened, none too reluctantly. "I'll be a sucker again. Tell him I'll pick him up about six."

BRAWLEY BROOK at seven o'clock the next morning was, as Gus told State Trooper Jerry Corcoran, even worse than he had expected. Every pool was rimmed solidly with fishermen, and on every riffle they were bumping into each other. A flood of ice-cold and badly roiled water was swirling turbulently down the stream, and the fish were staying on the bottom.

After a miserable half hour spent trying—most of the time unsuccessfully—to find enough free space for a cast, Gus waded ashore and began taking his rod apart.

"Quitting?" Jerry demanded.

"Call it that if you want to," Gus told him. "I call it having a lot more sense than I had when I came out here."

Jerry started to unjoint his rod too. "I guess there's no chance here," he agreed. "Let's go over to Rocky Creek—back in the woods where we won't have company. I

know a hole that ought to have fish in it."

"Waste of time," Gus said. "No self-respecting trout will take a fly with the water the way it is today."

Jerry grinned. "I've got a can of worms—brought them along just in case," he confessed. "You're not too proud to fish with worms, are you?"

"Let's go!" Gus retorted.

They got into his old but sweet-running roadster and started for the upper reach of Rocky Creek. When they came through a big patch of woodland, they saw a number of cars parked in a field ahead.

"More fishermen," Gus growled. "Why don't they park at the end of the road?"

"They're not fishermen—they're gypsies," Jerry put in. "There's a gang that camps there every spring. We have to keep an eye on them or they wouldn't leave a chicken in the county."

There were half a dozen battered jalopies in the field. A crowd of women in long, bright-colored skirts and dirty children in assorted rags milled around a cooking fire a short distance away. Tony was standing

at the side of the road, and he grinned and waved his hand at Gus as the roadster passed him.

"Friend of yours?" Jerry asked.

"Not so much so that he didn't swipe some stuff from the shop last year and try to talk me out of a battery yesterday," Gus told him. "But I sort of like the old pirate."

The road ended at the edge of the woods halfway up a fairly steep hill. Gus turned his roadster before they got out. "Somebody else might park here, and we might have some trouble turning around," he remarked. They took their tackle and followed a half-overgrown path over the ridge and down the far slope.

"This is the place," Jerry said when they came to a creek after 15 minutes of walking. "There's a deep hole under that high bank." He produced his can of worms. "Now we'll catch some fish."

AN HOUR later Gus landed his third trout. "Let's leave some for somebody else," he said with satisfaction.

They disjointed their rods and started back. At the top of the ridge Jerry pointed to a car parked alongside theirs. "Somebody's doing something to your car," he warned.

They saw a man lift something out of Gus's car, hurriedly put it in his own, and drive away. By that time they were running. "It's that Tony," Gus panted.

Jerry is young, and he beat Gus to the car. "He got your battery. We're stuck."

Gus didn't pause to regain his breath. He grabbed the battery cable, quickly wrapped a handkerchief around the terminal, and wedged it in the empty battery carrier. Then he released the brake and told Jerry: "Give her a push and jump in!"

The car began to coast down the grade with increasing speed. At 15 miles an hour Gus switched on the ignition, shifted into high, and gently let in the clutch. The engine coughed and started.

Although Tony had a half-mile start, they overtook his old, worn-out bus rapidly. "Pull over," Jerry roared, opening his fishing coat and pointing to his badge.

"Ah, Mis-tair Veel-son," Tony smirked as he stopped. "You breeng the bat-tair-ree I buy yesterday, so I take heem out your car. Ho-kay? I hope I make no mees-take."

"It's not O.K., and you made a big mistake. You're under arrest," Jerry growled.

"Wait a minute, Jerry," Gus said with a wink. He turned to Tony. "Are you sure

Tony smirked. "You breeng the bat-tair-ree I buy."



you're satisfied with the battery?" he asked. "Remember, any battery in the shop is \$14. Did you get the one you want?"

Tony grinned ruefully and brought out a fat, greasy roll of bills. "Sure, he's a fine bat-tair-ree," he said and peeled off \$14.

Gus took them. "No complaint," he said.

Jerry chuckled, but he told Tony seriously: "Now, you—I'll be out this way tomorrow morning, and when I get here you and your gang had better be somewhere else." Admiration crept into his voice as the squat man drove away. "Gypping a gypsy—14 bucks for an old battery!"

"I didn't gyp him. It was a new battery—I put it in just last week. But it'll do his soul good to think that he may have been gypped for once. It's lucky I kept the motor running while we were talking to him or we'd be the ones stuck."

"Say!" Jerry cut in. "How did you run this far without a battery?"

"It's nothing remarkable," Gus laughed. "But I wouldn't advise it except in an extreme emergency. You remember we actually started on a grade when you gave me a push. I had wrapped the battery-cable terminal to prevent shorting, and the generator supplied current after the engine began turning over fast enough. But if you ever have to try it, don't drive too fast, for it's hard on the points, coil, and condenser."

"Without a battery in the circuit, a generator is likely to build up too high a voltage. That burst of speed that overtook Tony may have cost me more than the profit on the battery. I'll check as soon as we get back to the shop. And don't yell at me to get you to work in a hurry—I'm staying under 25 until I put in another battery."

—AUTO IDEAS—

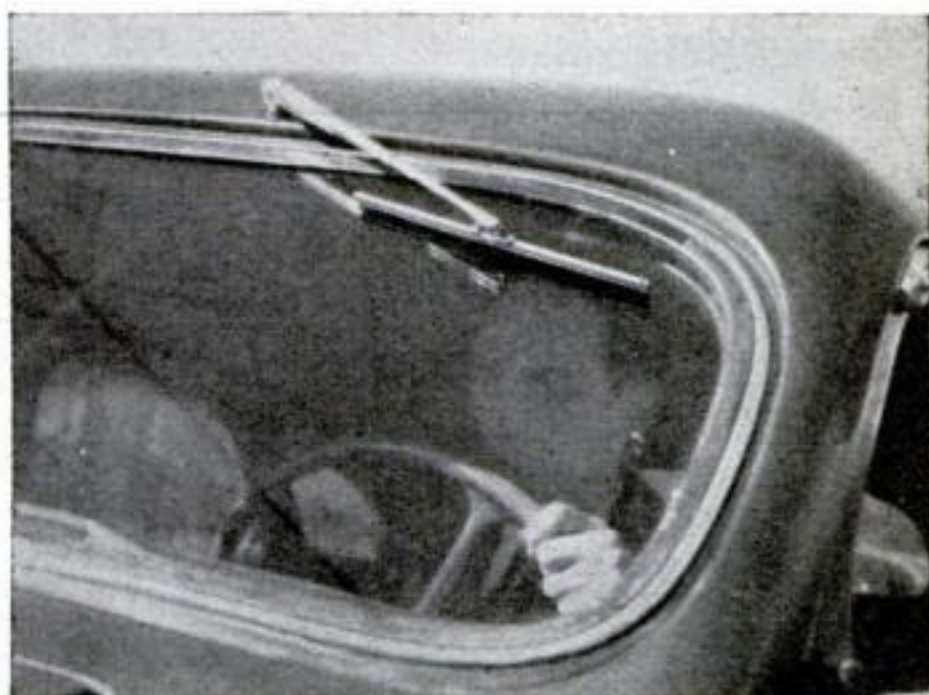
LONGER LIFE is in prospect for engines equipped with new "tri-alloy" bearings developed for military needs by the Ford Motor Company. Instead of cadmium, a metal in widespread use for bearings before the war, the new material consists of about 35 to 40 percent lead, 4.5 to 5 percent silver, .5 percent iron, and the rest copper. Tests have indicated the new bearings last three times as long as regular ones—even under the most trying conditions. When used on heavy-duty trucks, some showed no measurable wear after more than 50,000 miles. At the right, one of the bearings is being fitted to an engine at a Ford plant.



NO TOILSOME POLISHING is needed to give an automobile new luster when you use a cleansing solution produced by Parks Associates, of Glendale, Calif. After the car has been washed, the cleanser is applied with a cloth, an area about 3' square being cleaned at a time until the job is completed. Then it is rinsed off with water and allowed to dry. The makers assert that by using this cleaner it also is possible to renew the brightness of chrome or other highly-polished metals pitted with salt water. The manufacturer recommends it for furniture, tile, walls, and linoleum.

CHECKING A PISTON RING for trueness of periphery and width of gap requires only five seconds with an electronic gauge produced by the Sheffield Corporation, of Dayton, Ohio. After the ring to be tested has been inserted in a master ring of correct dimensions, the entire assembly rotates between scanning beams of light directed on photoelectric cells. The latter operate three signal lights, red, yellow, and green, indicating whether the ring meets specifications.

WIPER ARMS designed by the Anderson Company, of Gary, Ind., for use on military aircraft are said to hold blades securely under all conditions until a release lever is touched. The stainless-steel arms, currently available to civilian autoists, are adjustable for length and wiping pressure, and can be lifted out of the way when the windshield is cleaned. They will fit different types of wiper-motor shafts, a set of adapters being provided with each arm.



Will Tomorrow's Bus

New Power for Motor Coaches May Prevent Slow Movement of Traffic on Long Hills

WITHIN a few years motorists may find that buses are fully as agile as their own vehicles on long or steep hills and no longer slow pleasure cars behind them to a crawl.

That is one goal toward which advocates of twin-engine buses are working. The designers believe, in fact, that the greater horsepower and quicker acceleration obtainable with two engines eventually may become a necessity on some bus routes. Twin engines also offer interesting possibilities for interstate trucks, especially on long high-speed hauls of perishable freight.

Dual-engine motor coaches, of course, are not new, for a number have been in successful operation since 1927. But it now seems likely that they will come into wider use. Indicative of such a trend is a bus equipped with two medium-size engines that the Twin Coach Company, of Kent, Ohio, has developed. Designed especially for multi-engine power and mounted amidships under the floor, the engines operate independently, one furnishing power for each rear wheel.

Of 404 cu. in. displacement, each of the engines is rated 150 hp., two thus providing 300 hp. in all for the bus. In contrast, gasoline or Diesel engines now suitable for single installation in motor coaches develop only about 180 hp. A single engine yielding 300 hp. is considered impractical for use in a bus because its bulk and weight, concentrated in one spot, would take up badly needed space and necessitate a stronger and heavier frame.

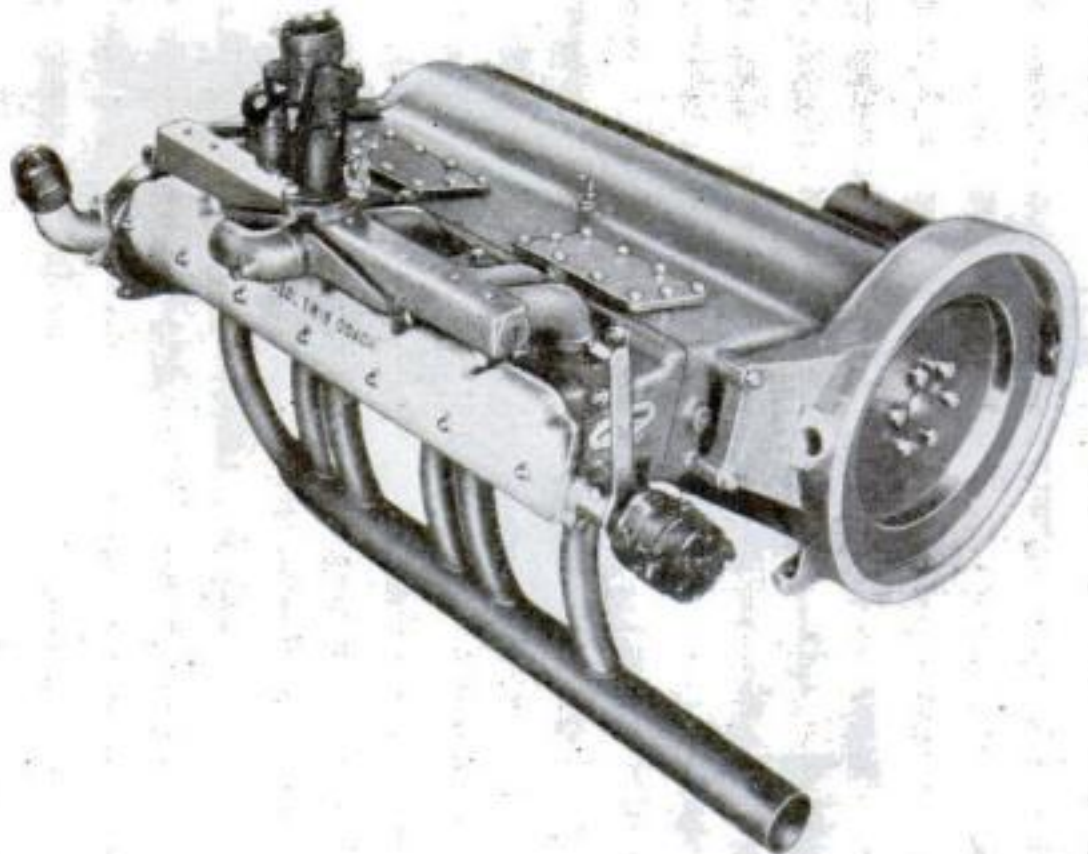
The Twin Coach engines rotate in the same direction. Thus they are readily interchangeable. Simply by reversing the cylinder block, and changing the overhead camshaft and cylinder head, one can be turned into either a right or left-hand engine. The intake manifold and carburetor are on the top side, the



exhaust manifold on bottom, and the spark plugs, valves, and distributor are toward the outer side of the coach in each case. Basically, the engine consists of three major parts, each of which is accessible for removal and overhauling independently of the others.

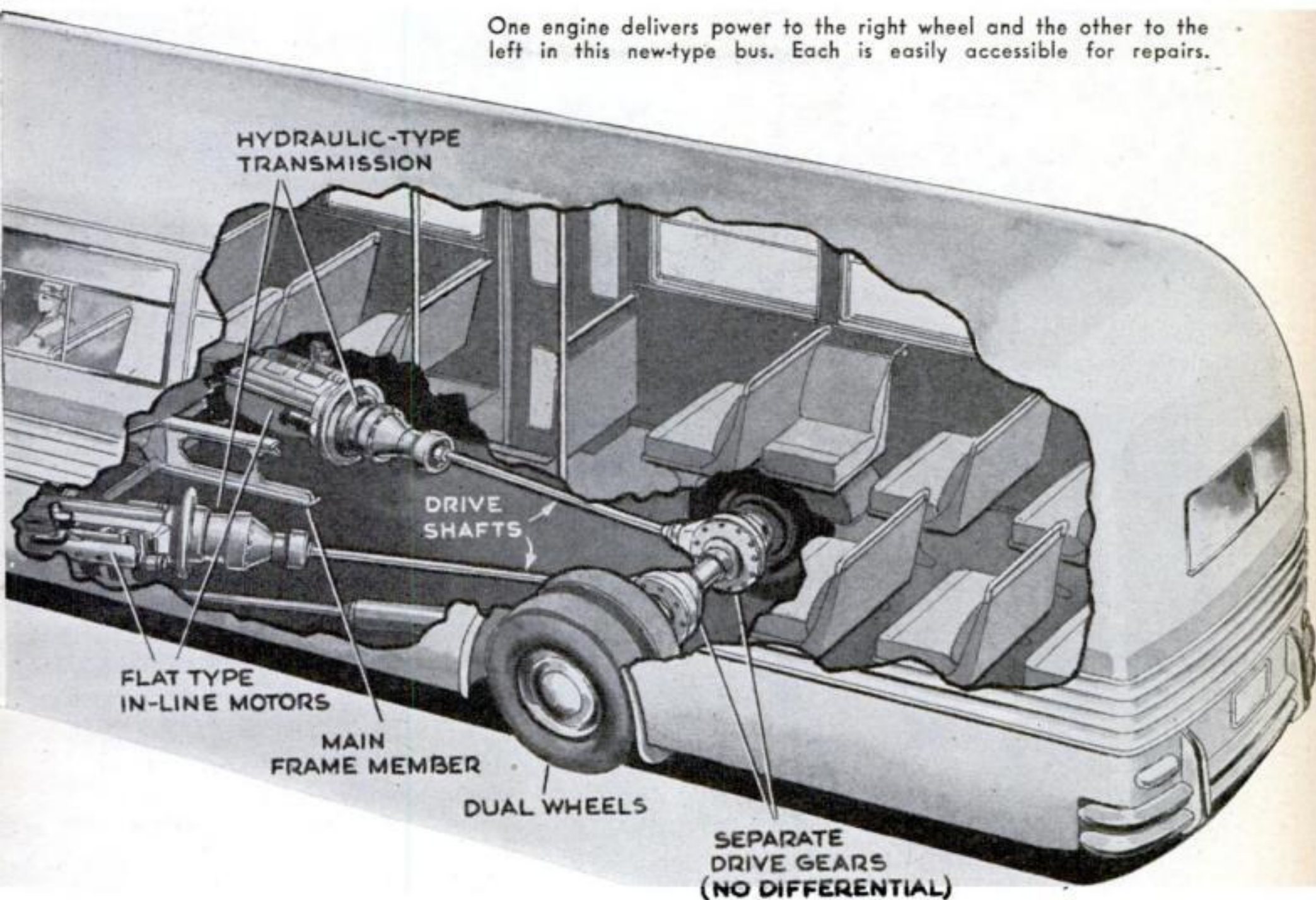
Fully equipped, the engines weigh 840 lb. each, or approximately 1,700 lb. for two—the average weight of the present single 180-hp.

Designed especially for use in a two-engine bus, this motor becomes either a right or left in-line type simply by reversing the block.



Have Twin Engines?

One engine delivers power to the right wheel and the other to the left in this new-type bus. Each is easily accessible for repairs.

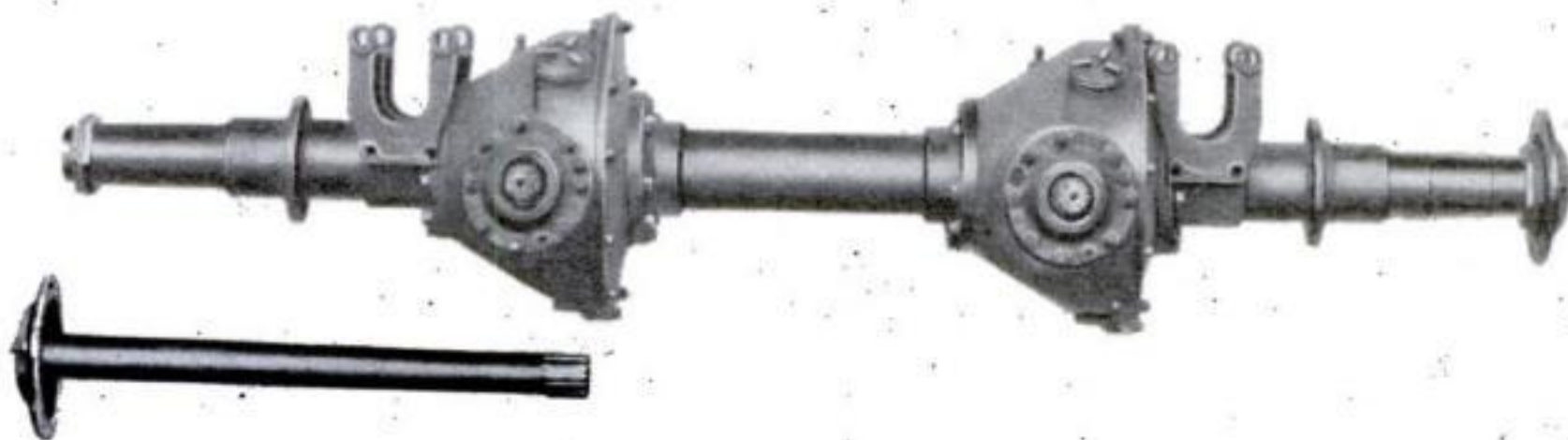


engine. For the same weight the horsepower is therefore almost doubled with two engines.

Since transmissions and rear axles for buses are currently being engineered for 175 to 180 hp., the use of a single 300-hp. motor would require a heavier and stronger design for these parts. But with twin en-

gines the load is so divided that standard units may be used, though the total power is almost doubled. Each engine has its own hydraulic torque converter, drive shaft, and hypoid drive gears. The two rear-wheel axles are entirely separate, and no differential is used.

Notice that the drive shafts are offset toward the same side because the two engines rotate in the same direction. There is no differential; the connection between the offset housings is merely for support.





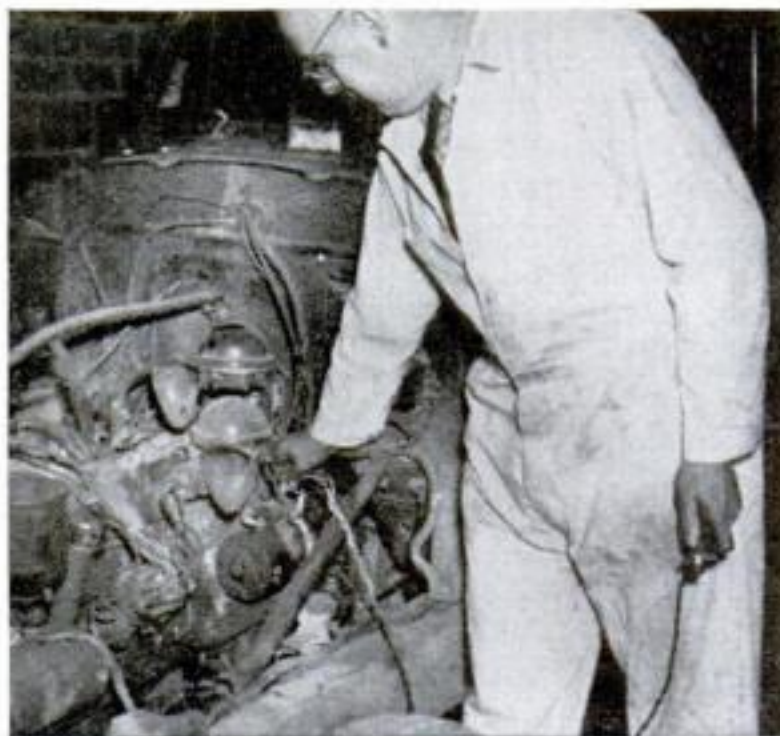
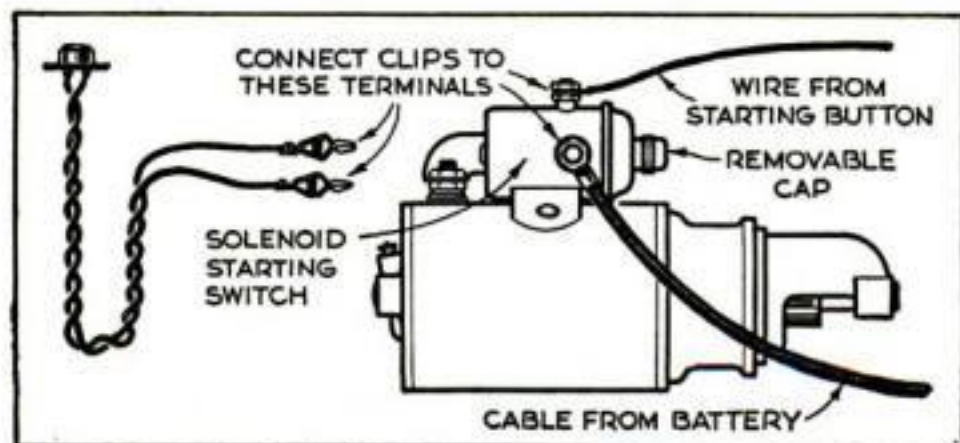
Style-conscious GI's give the hint to civilian drivers in designing jeep conversions that may soon adorn American roads.



FACE LIFTING of the snub-nosed and runty jeep, shown above in its familiar GI garb, results in the prettied-up version at left above. This jeep in mufti was turned out by mechanics at an Eighth Air Force bomber station in England who worked the transformation in their spare time, using only salvaged parts. The greenhouse job directly at the left is the product of air-minded GI's of the 644th Ordnance Depot on the Western Front. Modifications such as these could readily be produced in the postwar period for the modernization of existing surplus jeeps. While it is still uncertain if war-model jeeps will be manufactured in peacetime, the record of these sturdy little battle buggies will undoubtedly be a factor in light-car design.

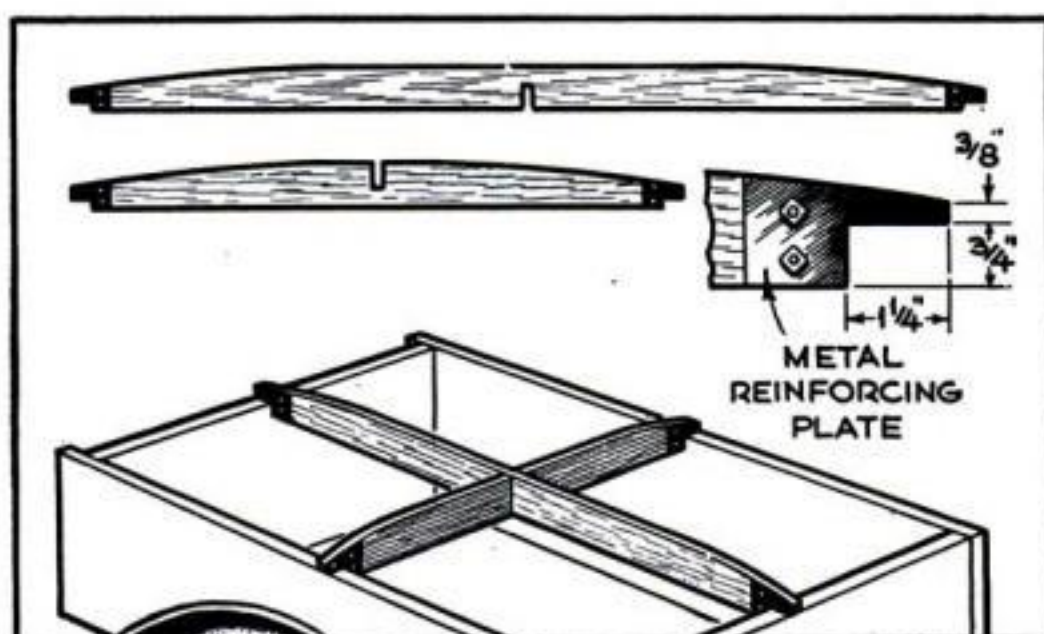
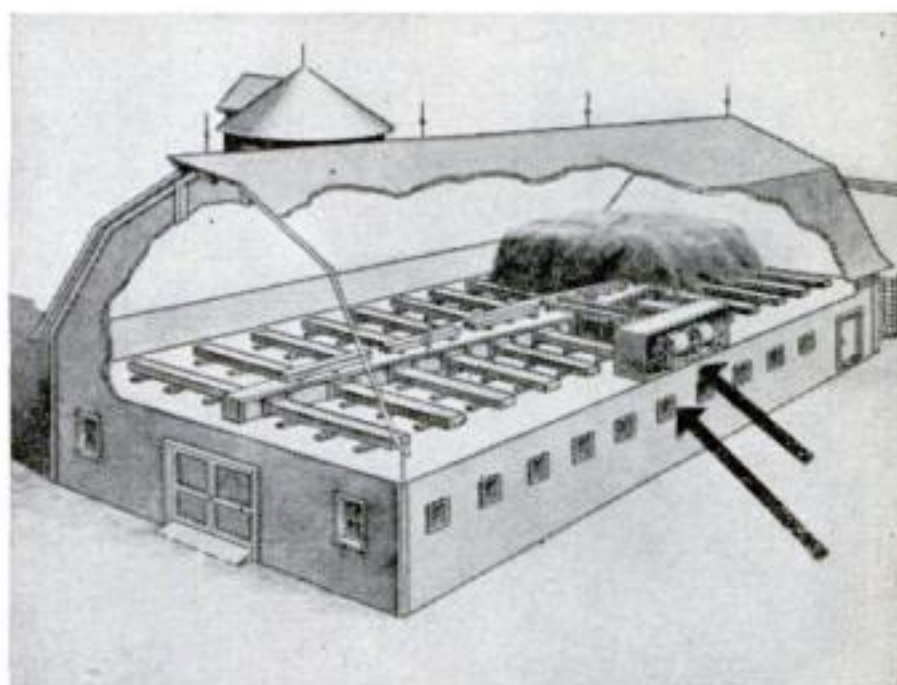


MECHANIC'S HELPERS being harder to come by than hens' molars, repairmen are often faced with the uncomfortable necessity of being in two places at once. Henry Lawrence, of Santa Fe, N. M., found it inconvenient to stop work and walk around to the starter button on the dash, or to the manual-operation button on the solenoid starting switch, whenever he wanted to turn the engine over during adjustment of the distributor or valves. So he attached a pair of spring clips to an 8' length of two-conductor wire, connected a pushbutton to the other end, and now has remote control of the starting motor wherever he may be working on the engine. It is connected as shown below.—E. S. HARRIS.





STORAGE OF HAY the same day you cut it is possible with a newly perfected barn-drying system announced by the General Electric Company, for you don't have to wait several days for the sun to cure it as in the past. The system consists of a motor-driven blower and air ducts placed on the floor of the loft or barn. Hay is piled on the ducts, and the air, driven through them by the blower, escapes through vents. A control developed by G-E permits either automatic or manual operation. Such a system virtually eliminates the danger of spontaneous combustion. Hay cured quickly in this way should bring higher prices, for it retains more of its nutritive value.



WATER RUNS OFF the canvas cover of a small trailer almost as quickly as it does off a duck's back if you use the rig at the left, reported in *Army Motors*. Two wooden braces provided with sloping upper edges and central notches are placed at right angles to each other so that they interlock and raise the center of the canvas. Water then drains off before it has time to soak through. Pieces of L-shaped metal may be bolted to the ends, as shown in the drawing, in order to protect the wood from splitting.

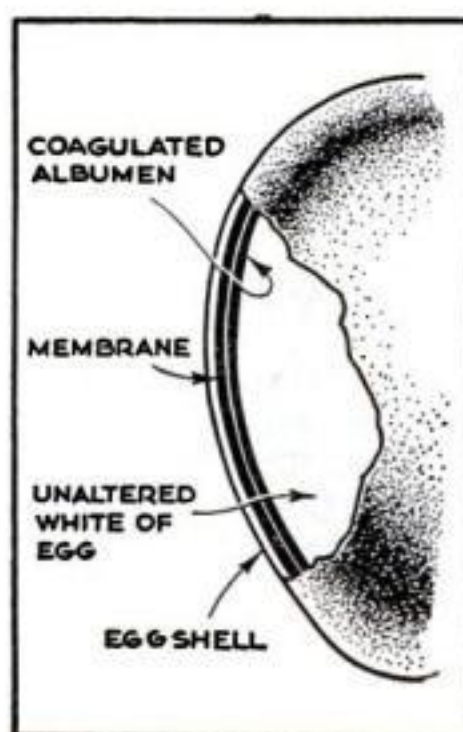
Eggs Are Preserved for a Year by Use of Flash Heat Treatment

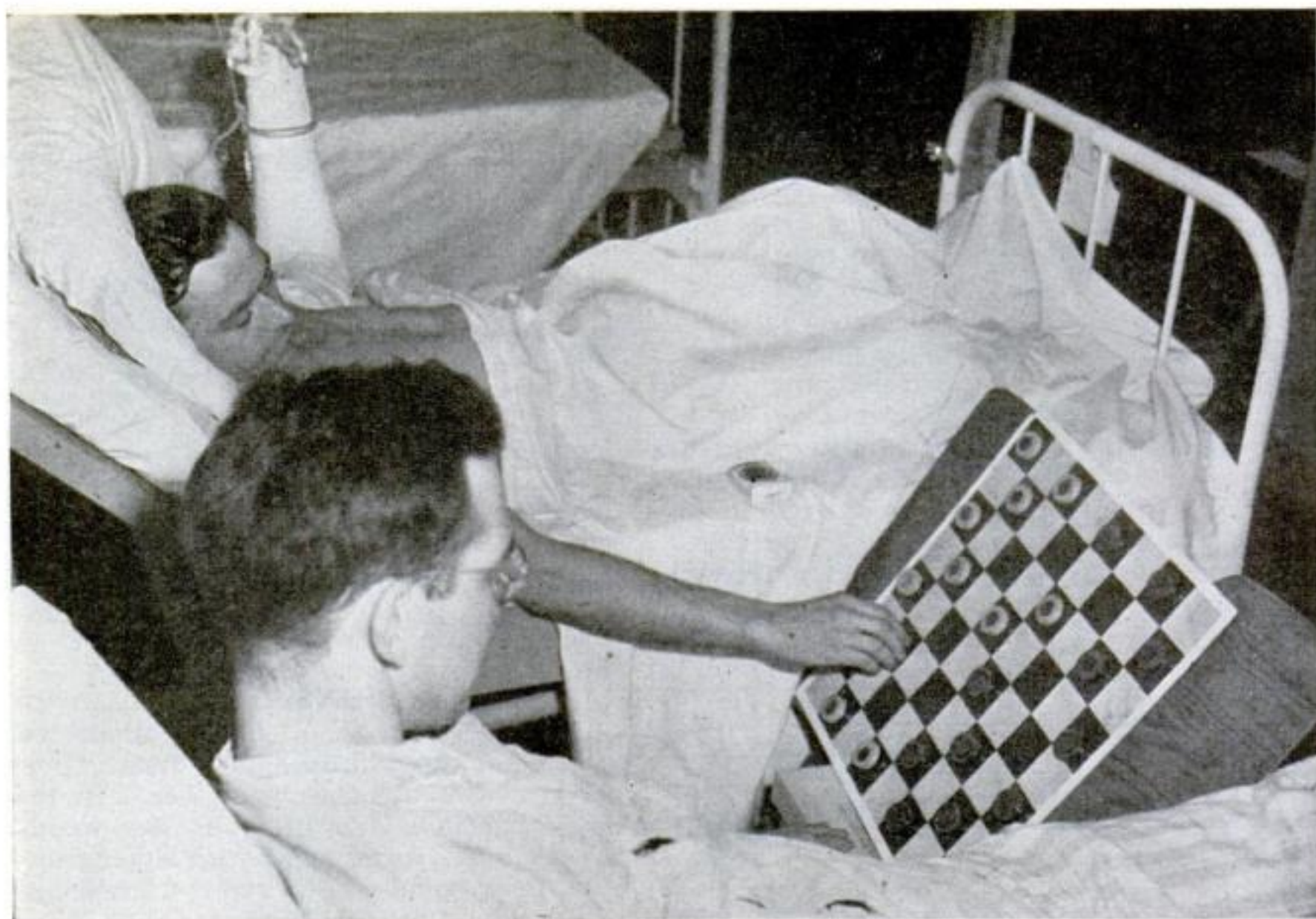
EGGS remain in edible condition for as much as a year when given a flash heat treatment developed by Prof. Alexis L. Romanoff of Cornell University. The heat coagulates a very thin layer of outer albumen next to the shell, forming a thin inside coating that protects the contents.

Suitable for either home or commercial use and requiring only average kitchen equipment, the treatment consists of plunging the eggs into boiling water for five seconds, letting them cool, and putting them in a refrigerator. Prof. Romanoff found that eggs so treated still were in good condition a year later when kept in a refrigerator at 41 deg. F. Even when stored at room temperature of 70 deg. they stayed good for three months. In contrast, untreated cold-storage eggs as a rule re-

main edible for only about six months.

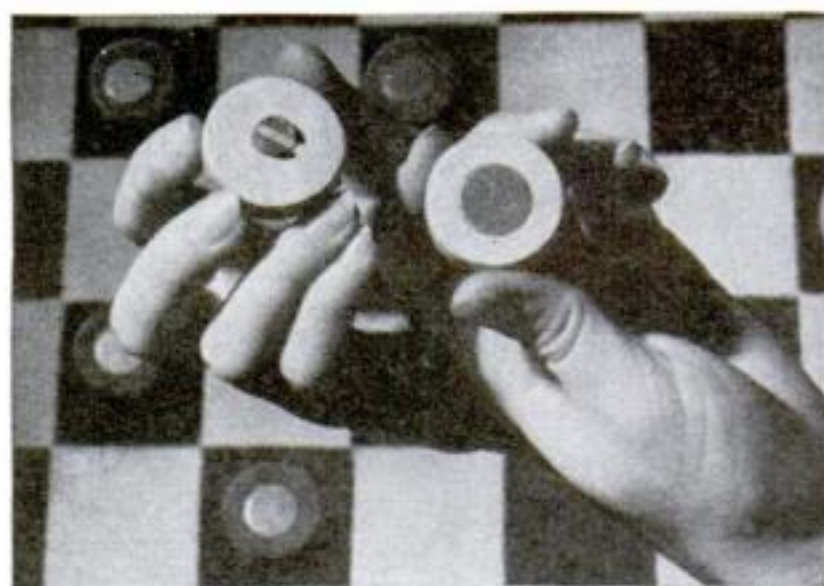
Fertile eggs hatch after the treatment, indicating that the nutritive value, flavor, and cooking characteristics are unimpaired. The stiffness of the albumen after beating, usually considered a criterion of storage eggs, is just about as good as that of fresh eggs.





Magnetic Checkers Stay Put on Vertical Board

A GAME that started out as an engineer's pastime has proved to be a boon to bedridden soldiers. While experimenting with novel uses of alnico, a magnetic alloy, Joseph Scardino of the General Electric Company turned up with this ingenious checker game. It consists of a set of ordinary checkers fitted with small magnets which hold them in place on a sheet-steel board painted off into squares. To provide an attraction between checkers when kings are wanted, a small metal disk is cemented to the top of each checker. Scardino presented the outfit to the Halloran General Hospital in New York. Since the game can be played without disturbing a patient's posi-

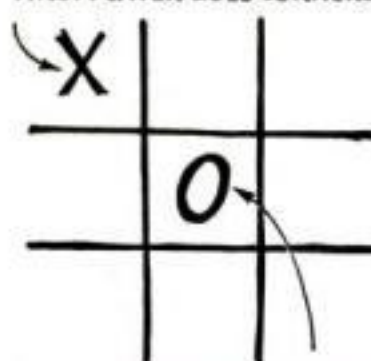


tion in bed, the occupational-therapy department of the hospital is having additional sets made as the required materials are obtained. Magnetic checkers have proved popular with hospitalized soldiers.

Maybe You Won't Win, But You Just Can't Lose

PLAYERS not practiced in the game sometimes find ticktacktoe exasperating because it so frequently ends in a draw. But when experts play, it always ends that way! The player who opens in a corner has the best chance to win, but the second player can't lose if he responds by moving into the center square and then avoids corners. If both players know this trick, every game will end in a draw unless they establish rules prohibiting this opening.—E. S.

FIRST PLAYER USES CORNERS



SECOND PLAYER AVOIDS CORNERS

POPULAR SCIENCE

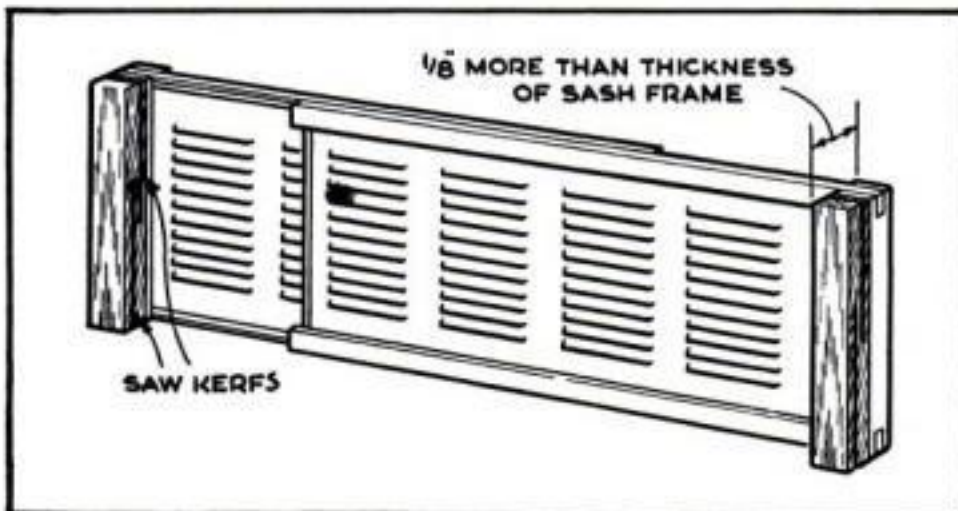


Phonograph Needle Used in Dividers

REMOVABLE divider points that blunt or break can be replaced by old phonograph needles, and some compasses can be converted into dividers by substituting a needle for the pencil. The needles will remain sharp a long time.—H. SAMUELS.

No Electric Fan This Summer? Harness the Nearest Breeze

EVEN in the dim, forgotten days when electric fans could be had, they still had a price. But then, as now, the wind was free. This wind deflector takes advantage of the fact that every latitude has its major directional breeze which blows most of the time from one point of the compass. If your house is hot while your next-door neighbor's is relatively cool, the chances are that your windows run parallel to, instead of across, the direction of the wind. Deflectors or vanes, made of waterproof plywood or similar material and mounted on angle brackets as shown, will turn the fleeting breeze in upon you.—B. M.



Two Wood Blocks Suppress Rattles in Ventilators

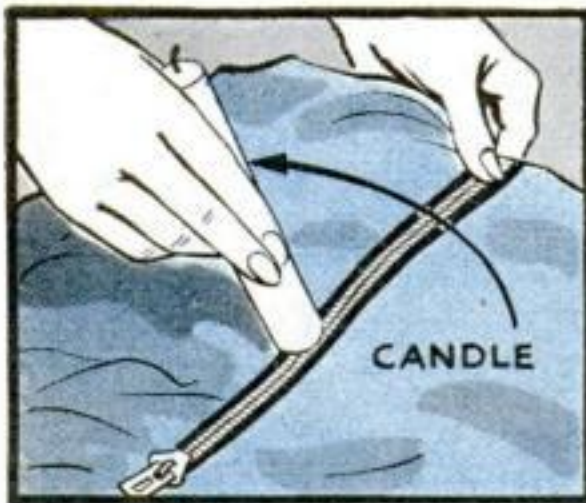
WINDOW ventilators that rattle persistently can be toned down a comfortable number of decibels by gluing on kerfed blocks of the size and shape indicated at the left. Kerfs bandsawed from both ends and overlapping about an inch at the center will give the necessary spring action for a secure fit.—DANA S. GREENLAW.

Army Ammunition Boxes Make Versatile Home-Front Servants

WITH metal containers either exorbitantly priced, unavailable, or unsatisfactory, I have found welded ammunition cartons on sale at some stores to be useful substitutes for a number of household articles. Each box has a folding handle, shoulder-strap buckles, and a latch for a padlock. It is useful as a lunch box, a fire-resistant chest for money and valuables, a case for camera accessories, or a small tool kit. I converted one of them into a mailbox better than I could have bought at three times the price.—M. REYES.



KEEPING THE HOME



If zippers develop a tendency to stick or jam, you can ease their operation and prolong their life by rubbing them with a wax candle.

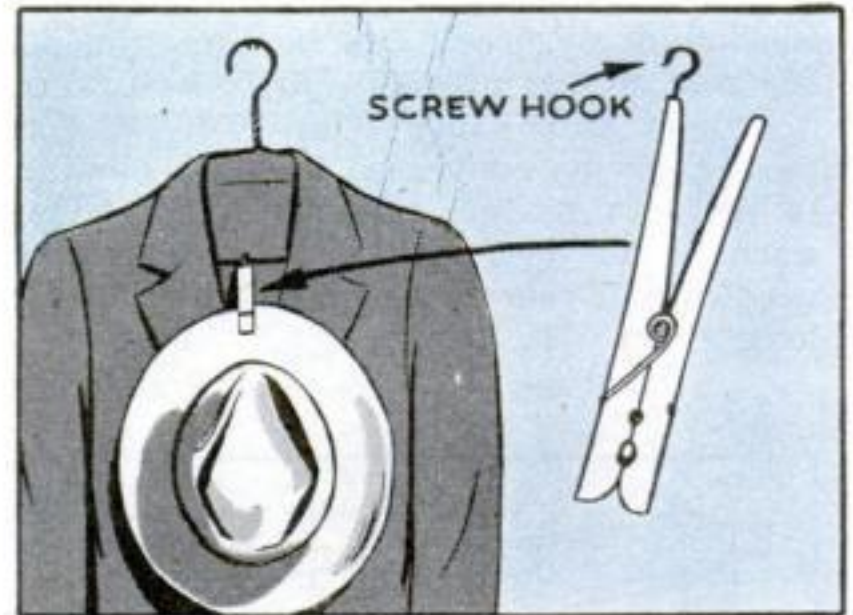


A roomy sewing basket can be made out of an old lampshade by pasting a cardboard disk to the bottom and sewing in a sturdy fabric lining.

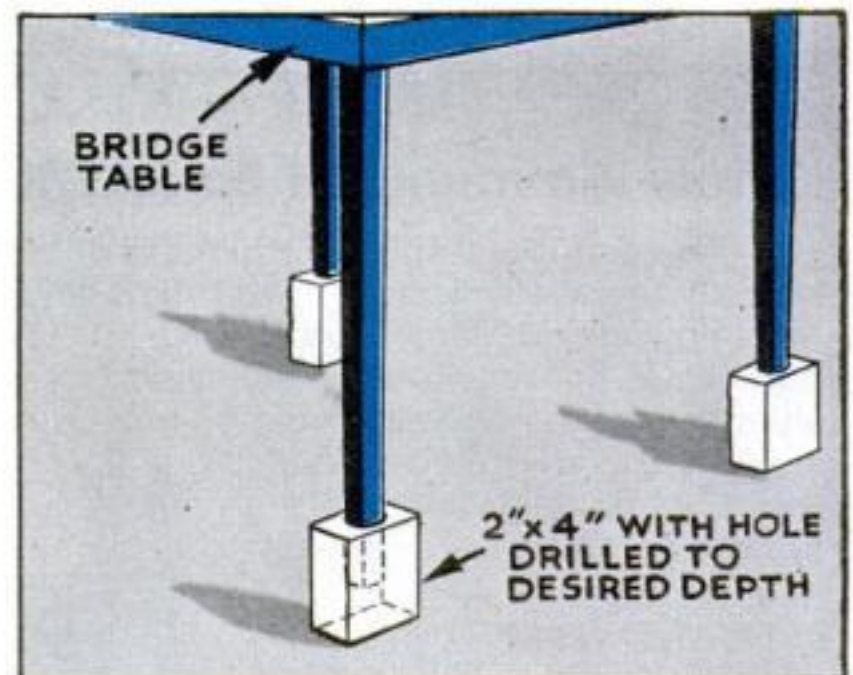


Hot pies will cool more quickly if placed on top of a colander. The perforations allow cooling air to flow underneath as well as on top.

When in doubt as to whether a second postage stamp is needed for a letter heavier than usual, you can improvise a surprisingly accurate postal scale by balancing a foot rule across a hexagonal pencil. Place the scale on a flat surface, and use two half dollars or four quarters as weights. Center them over the 2" mark, the letter on the 10" mark. For 1/2-oz. air mail to overseas service men, use two quarters or one half.

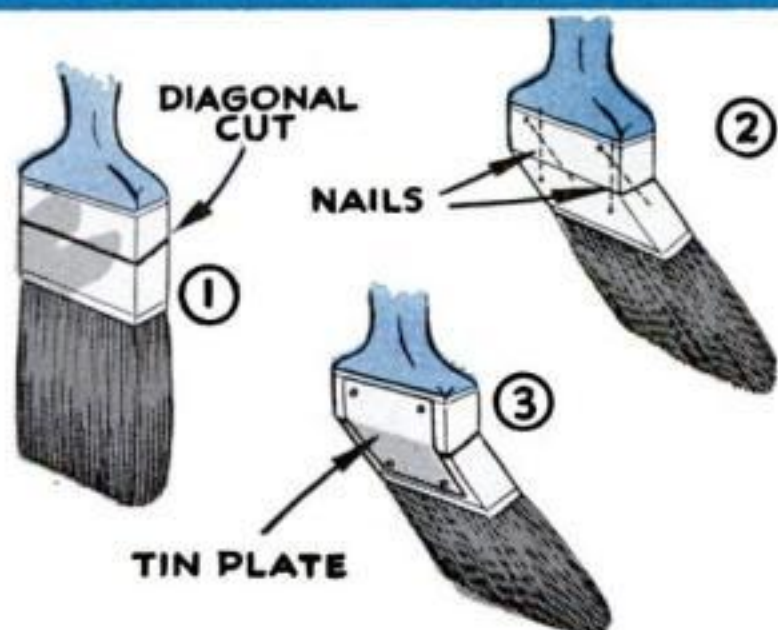


At your next party or club meeting, you'll find it helpful to try this method of keeping coats and hats together without confusion. A spring-type clothespin, fitted with a screw hook, holds the hat neatly to the trouser bar of the hanger.

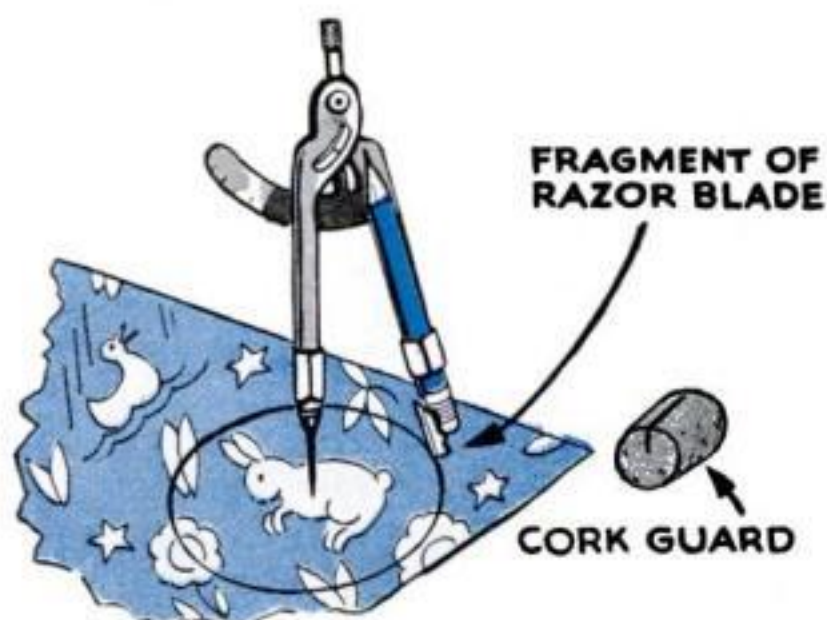
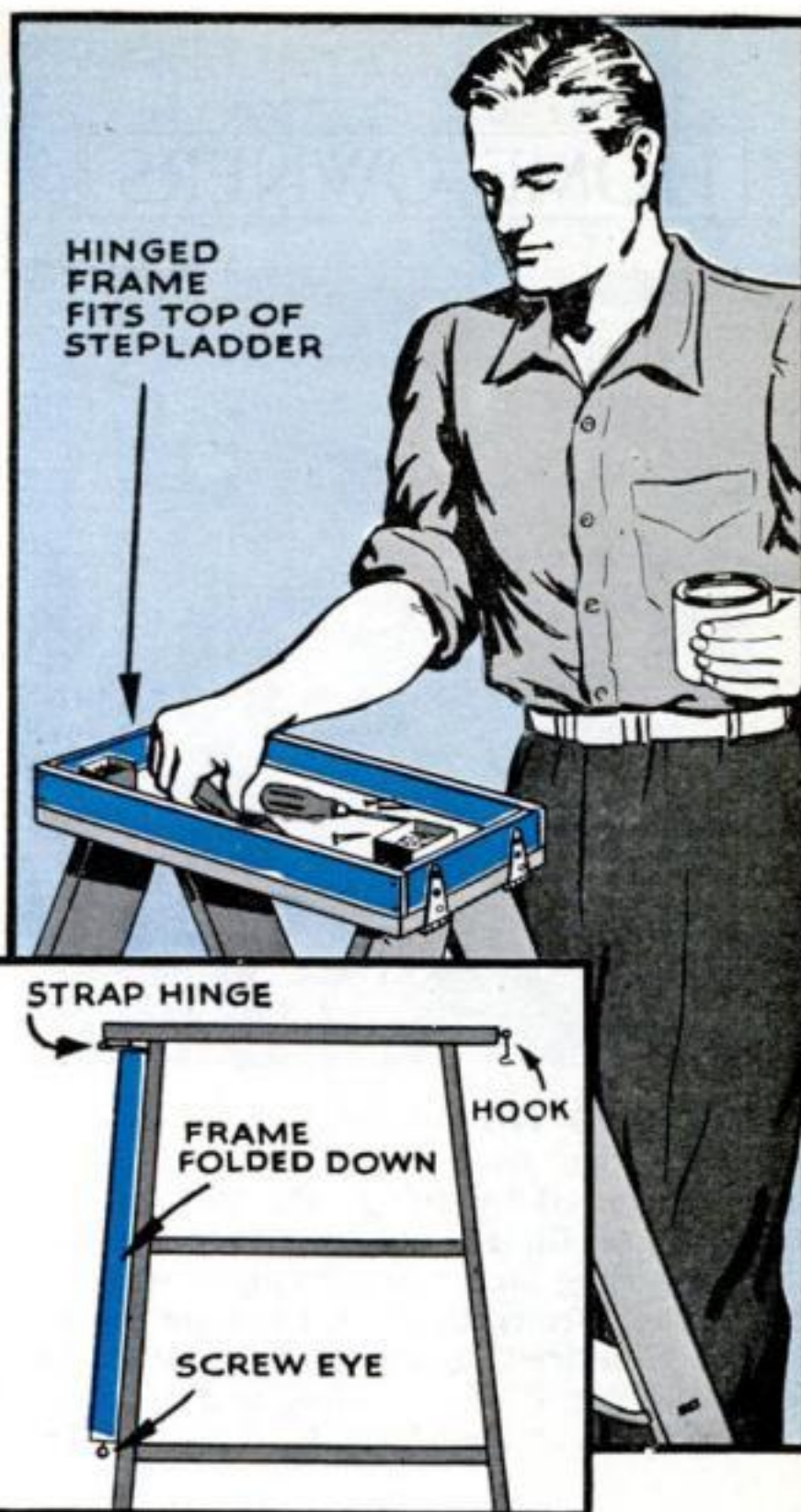


Extra dinner guests will sit more comfortably at a bridge table raised to regular table height. A set of wooden blocks bored to take the legs will elevate the table to the correct height.

SHIPSHAPE



Inaccessible corners behind pipes or fixtures can be cleanly painted with the aid of a curved paintbrush. Saw diagonally through the arm, reverse the pieces, and toe-nail them together. Add a piece of tin-can metal as reinforcement.



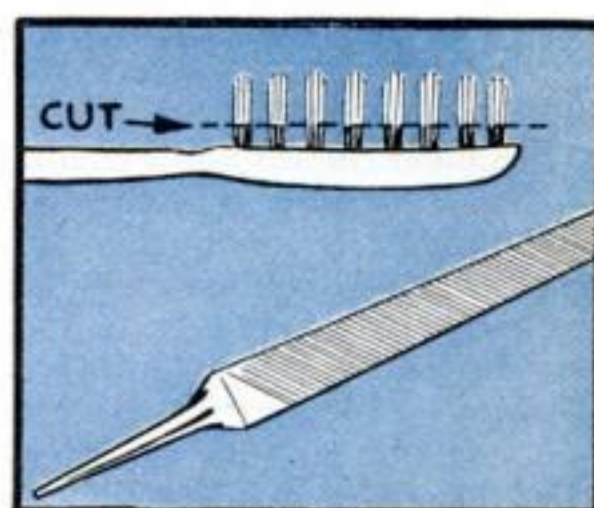
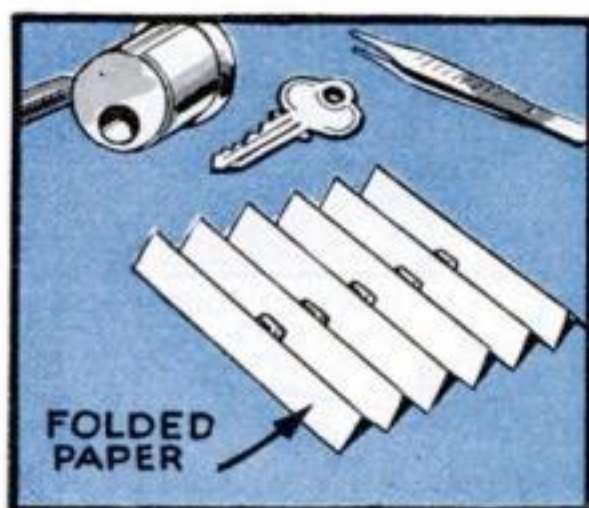
Adapting an ordinary compass for cutting perfect circles requires only a metal-headed pencil and a sliver of razor steel. Solder the blade fragment to the pencil head with about $\frac{1}{4}$ " of the sharpened edge projecting, and use as you would a compass.

Tools and equipment can be prevented from rolling off the top of a stepladder by a railing that can be swung on or off as needed. Hinged at the edge so that it can be folded back along the leg, the frame does not interfere with use of the top step.

When repairing tumbler locks, it is essential to replace the pins in correct sequence. Instead of relying on memory, keep the parts in order in a folded paper tray.

Heavy kitchen fixtures need not scratch or break the linoleum if rubber-heel cushions are inserted under each leg and trimmed to project very slightly on all sides.

File teeth can be cleaned with the same kind of brush you use on your own teeth. Trim the bristles of a discarded brush to about $\frac{1}{8}$ " from the base to obtain a stiff surface.





HOME OWNERS

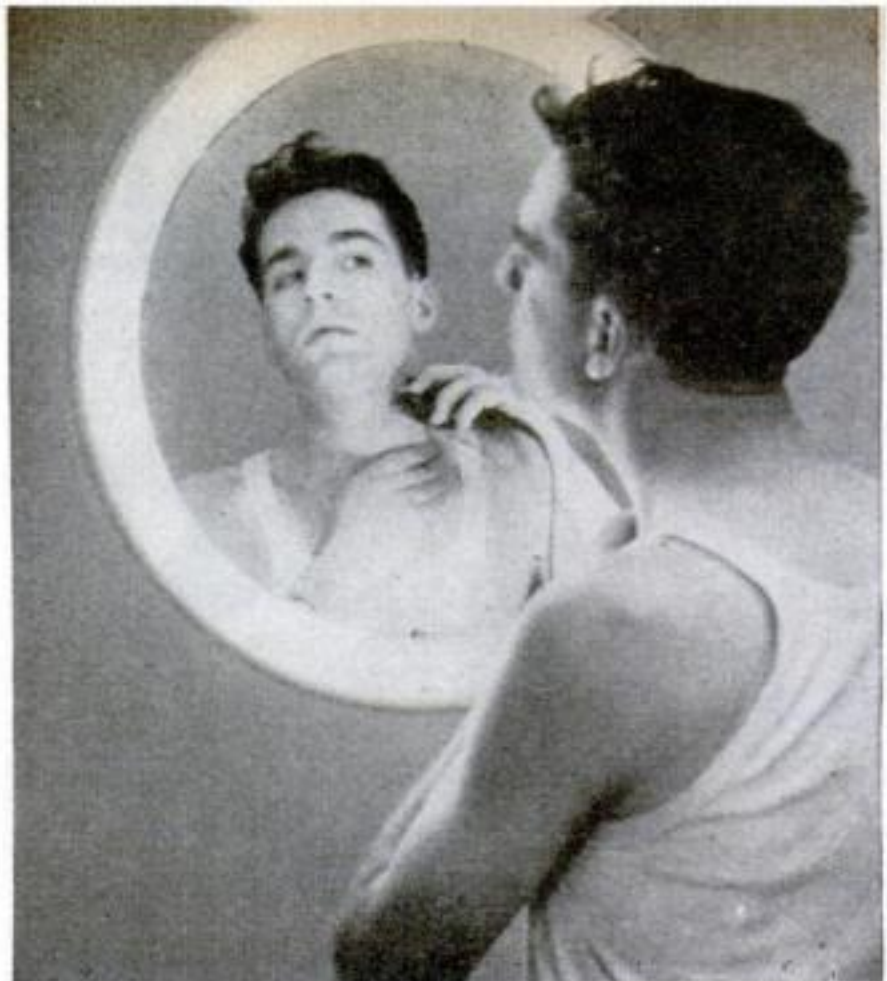


CORK-FILLED TAPE designed to stop condensation drip from cold-water pipes has been introduced by the J. W. Mortell Co., of Kankakee, Ill. Pliable and easily applied, it forms a snug jacket around pipes, fittings, and valves. Brown in color, the tape can be painted if desired. It comes in a coil sufficient to cover 7' of $\frac{1}{2}$ " pipe, and no tools need be used for installing it.

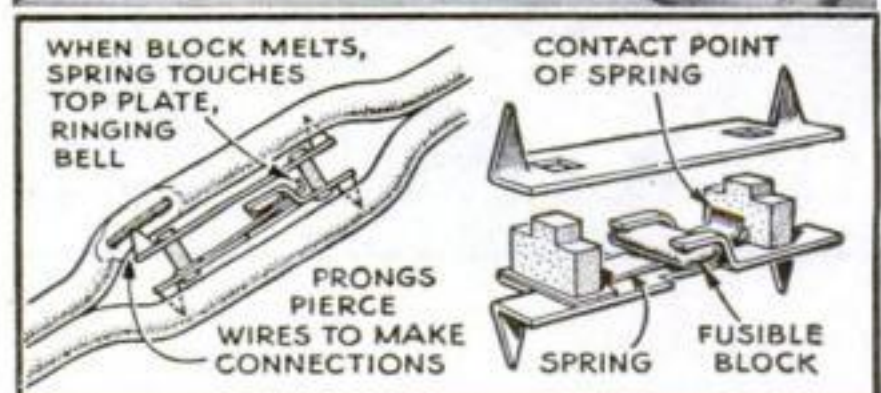
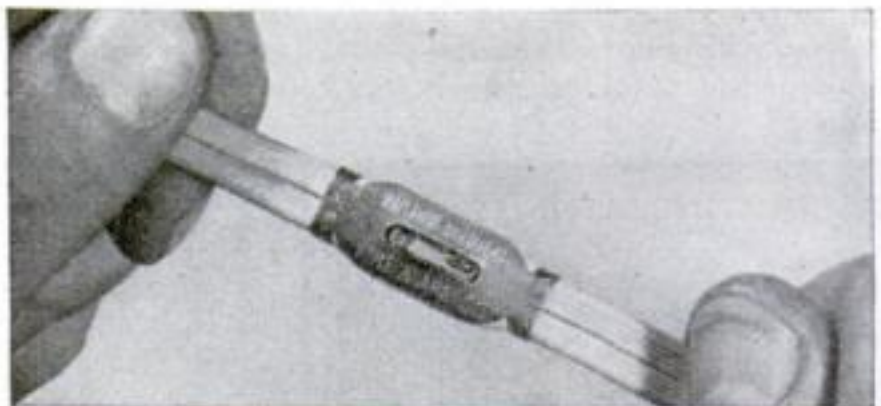
WOOD PLASTIC developed by the So-Lo Works, Inc., of Loveland, Ohio, can be handled like wood itself—sawed, planed, and finished in any color desired. According to the maker, it is waterproof, shrinks little, and keeps soft and workable for years. It is available in $\frac{1}{3}$ and 1-lb. jars or in 5-gal. and drum sizes.



LOW-COST FIRE ALARM. Automatic heat-sensitive units spaced at 10' intervals in a flexible wire form the basis of the Warner Home Fire Alarm, made in Glen Ridge, N. J., by the Millwood Products Co. When any unit is subjected to heat of 150 deg. F., a fusible block melts and automatically closes a circuit, ringing a gong. The system is sold for installation by the purchaser, complete with bell, transformer, insulated staples, and instructions. It can be quickly installed along baseboards and moldings. Millwood Products is a unit of Junior Achievement, an organization intended to give teen-agers a practical chance to learn about business at first hand.

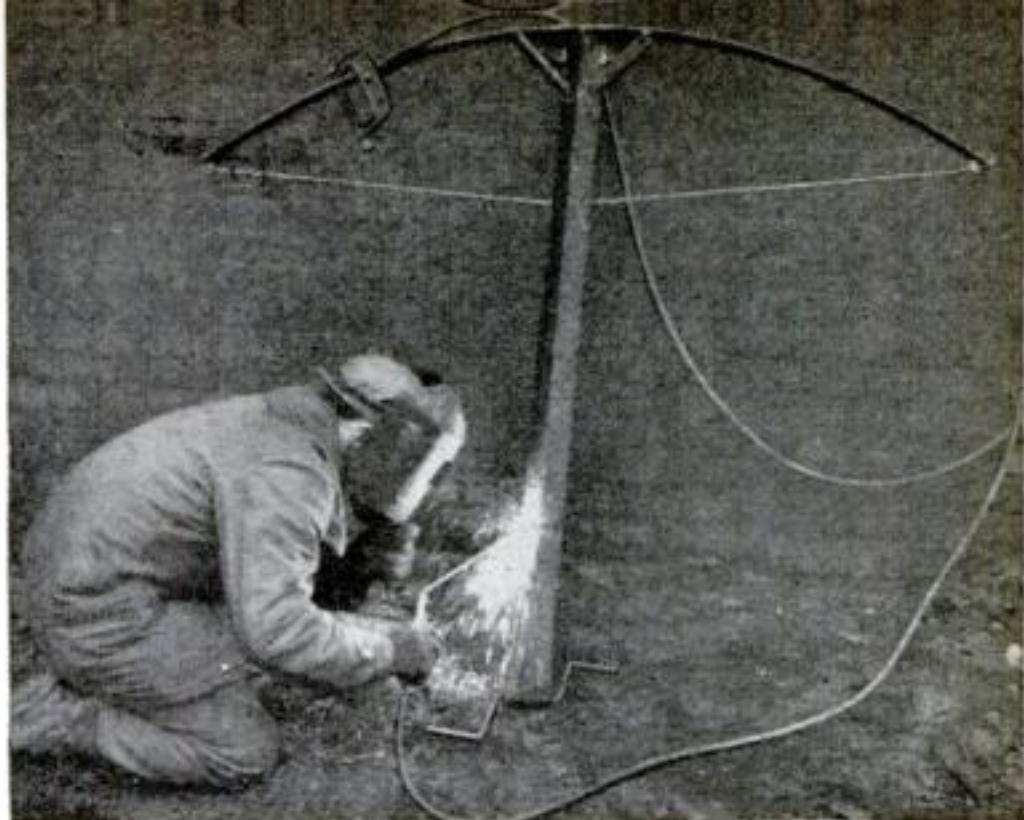


SHADOWLESS LIGHT is provided for the bathroom mirror above by a circular fluorescent lamp hidden from head-on view in a reflector. Finished in a dull white color, the lining of the reflector distributes the light evenly on the face and neck. The lamp was designed by the illuminating engineering department of the Westinghouse Lamp Division, at Bloomfield, N. J.



ARCHAIC WEAPONS still have a place in modern war, as evidenced by the crossbow grenade thrower at right. The device was welded together by T/4 Alan J. Hamm of the 26th Infantry. Note the two-handled crank for cocking the bow.

JEWEL-LIKE PLASTIC forms the glittering coach shown below. It was fashioned by Emile Norman, of El Monte, Calif., from gray, frosty white, and clear plastics. The coach has a removable top and holds a container for flowers. Norman also makes one-of-a-kind lamps, ornaments, and picture frames of plastics.



**MADE BY
AMERICAN
CRAFTSMEN**



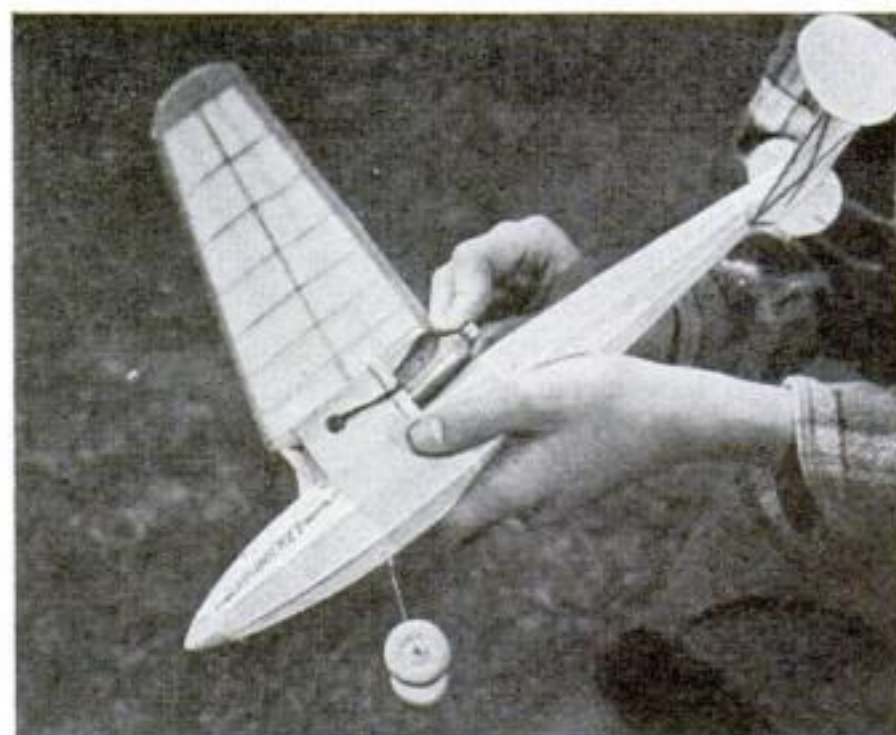
PLANE BUILDING is almost an around-the-clock job for Edward Soltis, whose brother is a bombardier on a B-29 Superfortress. As a metal fitter in the Eastern Aircraft plant at Tarrytown, N. Y., he helps produce real planes. A deaf mute since a childhood illness, Soltis builds models in his spare time. Using pictures and magazine illustrations, he drew up his own plans for the Avenger torpedo plane above, scaling the drawings to give it a 28" wingspread, and then devoted 150 hours to its actual construction. Features of his model include a functioning bomb bay, wing slots and flaps, gun turret, machine guns, landing lights, retractable landing gear, and a model torpedo.

INTEREST COMPOUNDED with skill as a craftsman enabled San Francisco banker Howard Whittle to turn out these meticulously finished projects of rare wood. Using mainly a lathe and a bandsaw, he has applied many features of the metalworker's art to his wood creations. Note the delicate designs in the plates and jewelry below, some of which utilize as many as 660 pieces of wood from all over the world.





One method of launching the plane is to push it into a glide while piercing the gas chamber as shown at the left. Below, the carbon dioxide cylinder is being placed in the cockpit housing.



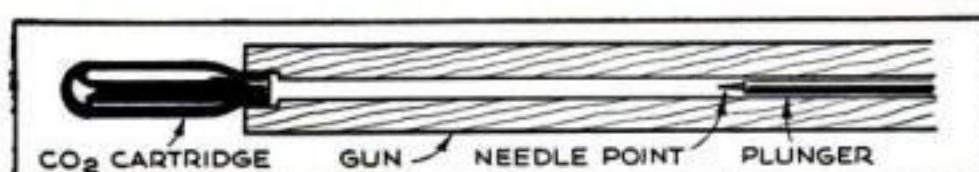
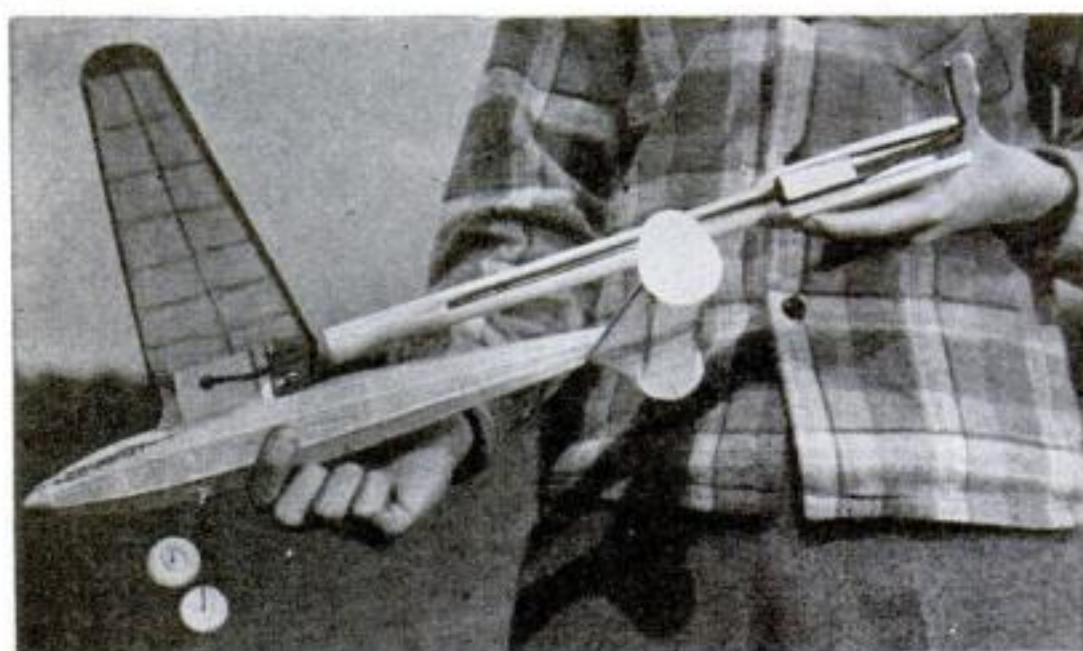
The gun fits the neck of the cartridge, and a pin in the barrel shoots forward to puncture the seal.

Carbon Dioxide Gas Cartridge Powers Model Jet Plane

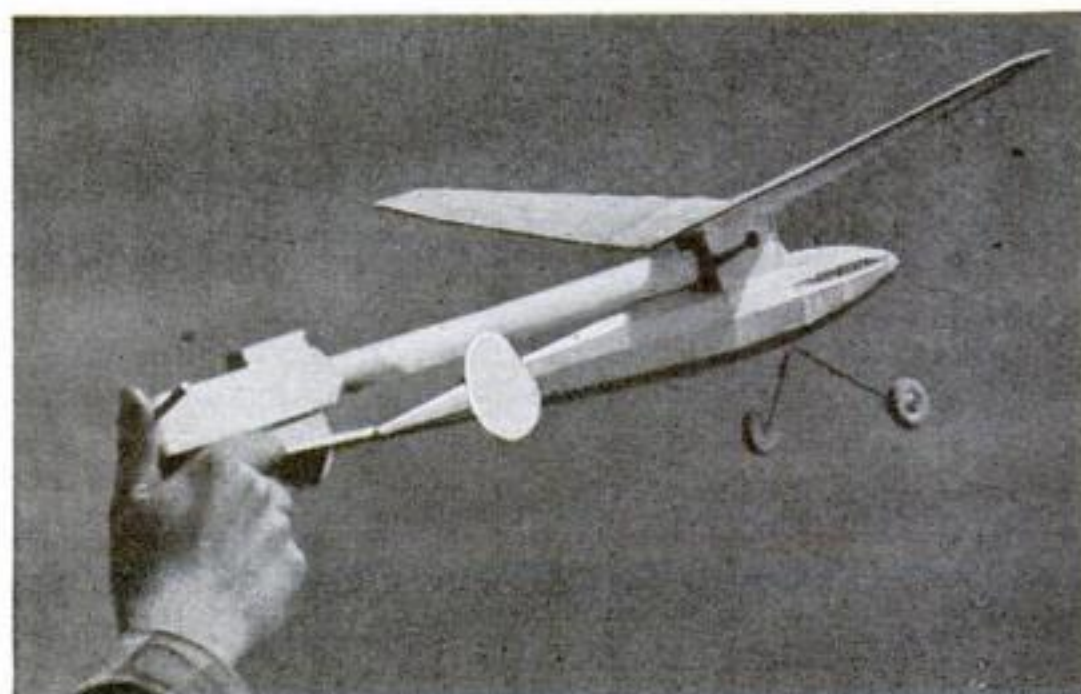
NEVER far behind the aircraft industry, model-plane enthusiasts are losing little time in getting acquainted with jet propulsion. For those who want to study the technique before designing original craft, commercial kits are available similar to the one used in constructing the model jet plane shown on this page.

Jet action is obtained through the use of carbon dioxide cartridges of the type used to inflate life rafts. Since Army-Navy standards run high, the rejects available for powering the jet planes pack plenty of punch. Even more important, CO₂ is completely harmless and therefore a safe jet propellant for beginners. Because the weight of the gas chamber changes while the gas is being discharged, it is mounted in such a position that it will not affect the plane's center of gravity.

Michele de Santis, Jr., of Bayside, N. Y., shows how to load and launch the plane. A needle in the gun, as in the drawing at the right, pierces the cartridge seal. Aircraft Products Co., makers of the kit, also manufacture the gun.



As the cartridge neck is held firmly in the gun barrel, the firing pin is sure to strike it squarely. This impact helps the plane take off before the jet stream goes into action.

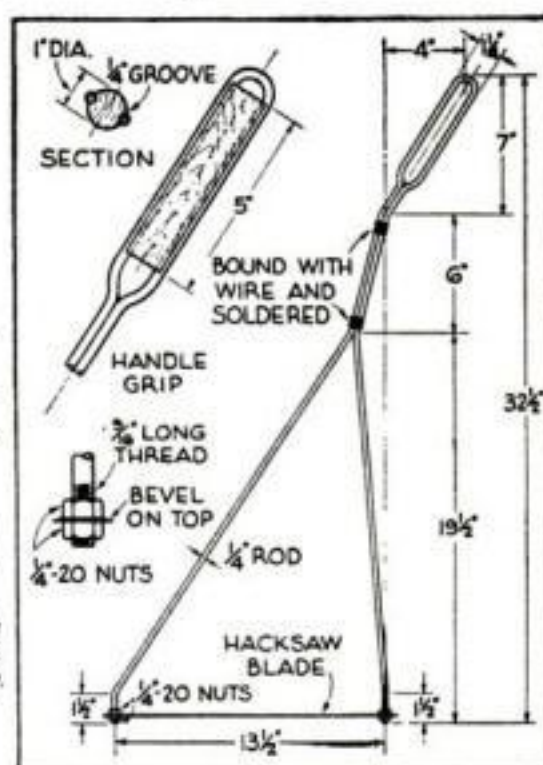


Ground Hacksaw Blade in Frame Cuts Back Neglected Grass

WHEN your lawn gets ahead of you, as it might during a series of week-end rains or while you are on your vacation, a hacksaw blade can come to your rescue for cutting it down to where it can be handled with the lawn mower. The blade should be one that is hardened all the way through so it can be ground sharp on both edges. Held in a frame bent from $\frac{1}{4}$ " soft steel rod, it cuts on both the forward and backward stroke.

Enlarge the holes in the ends of the blade with a punch, if you have one, or drill them out after softening the ends by heating to a cherry red and letting them cool in air. Thread the frame, as indicated, and secure the blade between nuts.

Leave the handle open, or groove and shape a piece of wood as shown and fit it in



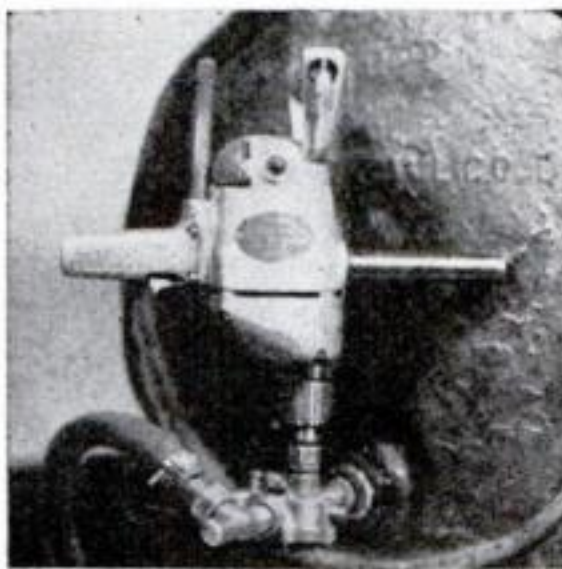
place before binding the frame with wire. Dimensions may be changed to suit any size blade. The handle should be long enough to make stooping unnecessary.—A. BOHN.

Electric Drill Powers Pump For Moving Liquids from Drum

POWERED by a $\frac{1}{2}$ " electric drill operating at 400 r.p.m., a discarded $\frac{1}{2}$ " rotary-type marine water pump is used in the Sun-Journal pressroom at New Bern, N. C., to

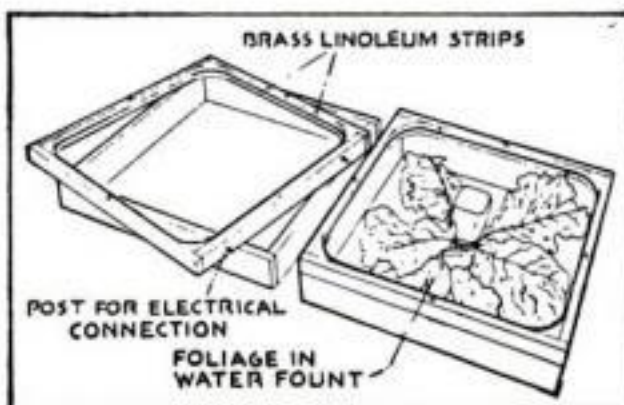
fill press fountains with printer's ink from drums. The drill is mounted on the drive shaft of the pump, as shown in photos at left. All fittings are standard, those for the pump being $\frac{1}{2}$ ". The hose used to carry the ink from the pump is $\frac{3}{4}$ ", however, in order to keep the flow free. This rig is far superior to the hand pump previously used.

Such a device should also be able to handle any oil or grease light enough to flow into the intake of the pump. If hose longer than 8' is used, or the fluid is heavy, a larger diameter may help to relieve back pressure.—HUBERT E. JONES.



ELECTRIC FENCES in miniature are used by entomologists at the Du Pont Pest Control Research Laboratory at Wilmington, Del., to keep crawling insects within bounds. The insects, large numbers of which are used in experiments, are given the freedom of open, panlike boxes containing growing plants on which they feed. Around the rim of the boxes are two of the narrow metal strips normally used on linoleum. Wires carrying low-voltage

electricity are attached to the strips, making a barrier similar in effect to electric fences on farms. Wandering insects that crawl up the inside walls of the box come into contact with the electrified strips. This isn't fatal, but it is discouraging.



Even Novice Carpenters Can Improve
Their Living Quarters at Low Cost

HAMMER-AND-SAW UNIT FURNITURE

YOU MAY be like many other Americans these days—living in an apartment or room which lacks the furniture you need to make it comfortable. But you don't need to despair if you can borrow a hammer and saw; and don't think that you have to spend a lot of money. Here are three smart and functional pieces of furniture: an end table, a bookcase, and a lamp, all born of a designer's need for such items in his wartime home. Your own ingenuity may add some new touches.

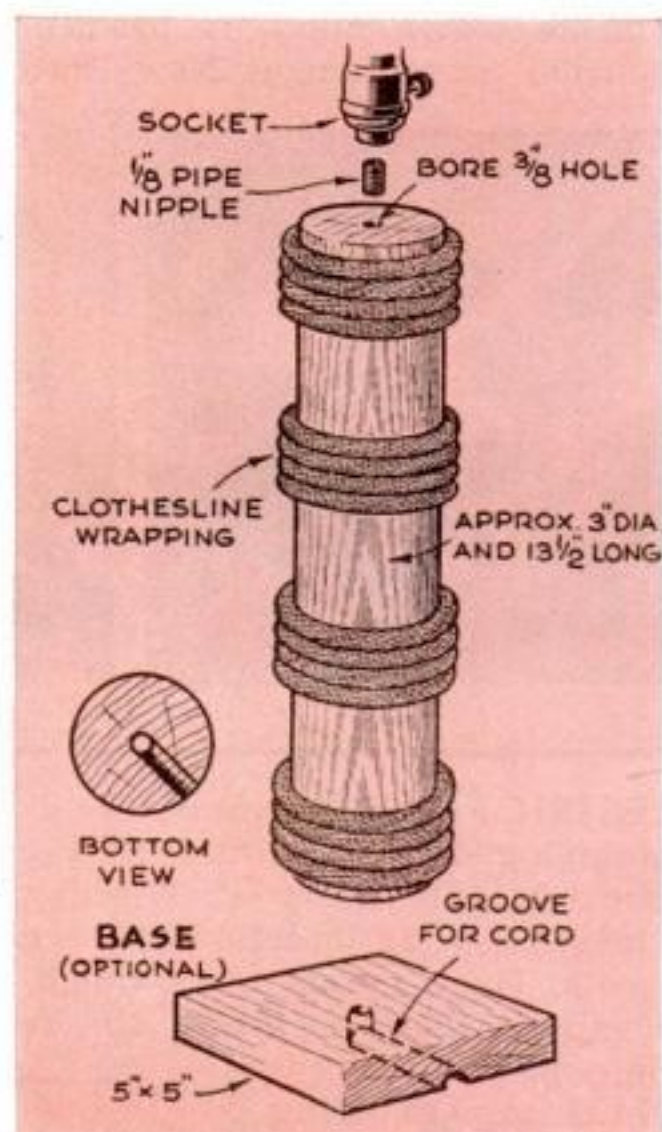
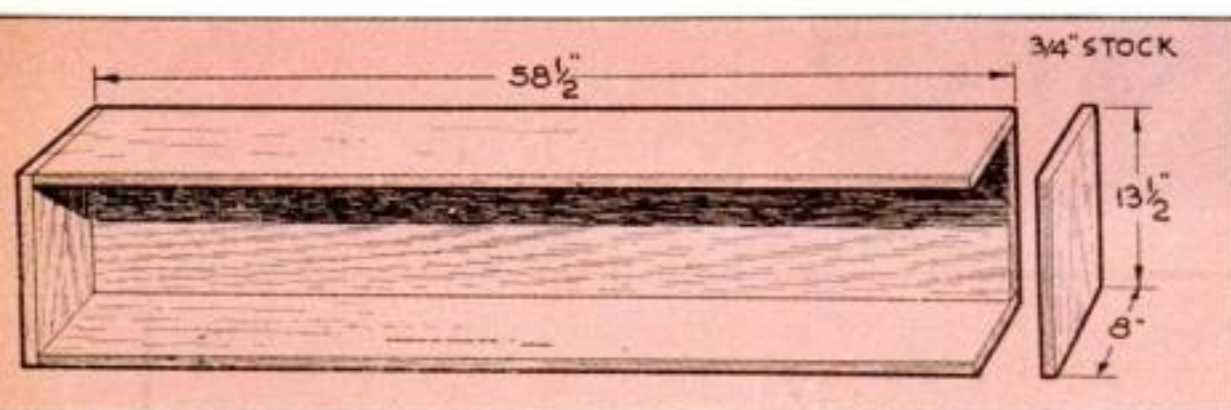
The lamp upright is nothing more than a section from one of the wooden poles placed inside rugs when they are rolled for shipment from the factory to stores. Usually these are thrown away or sold as junk. A hardwood rolling pin might also be used. Cut a suitable length from the pole and bore a center hole for the cord, working from both ends toward the center. (If you use a rolling pin, you may find it is already provided with a hole.) The decorative wrapping is simply a piece of clothesline, dipped in dye, if you wish, to match a room color.

Essentially, the bookcase is just a rectangular box. But if attractively finished, it can be used to good advantage over a couch, desk, or any long wall space. Long screws should be used to secure it to the studs within the wall. Bric-a-brac as well as books will find display space on the shelves.

The end table will fit almost any surroundings, depending on the care put into its finish. Ordinary pine



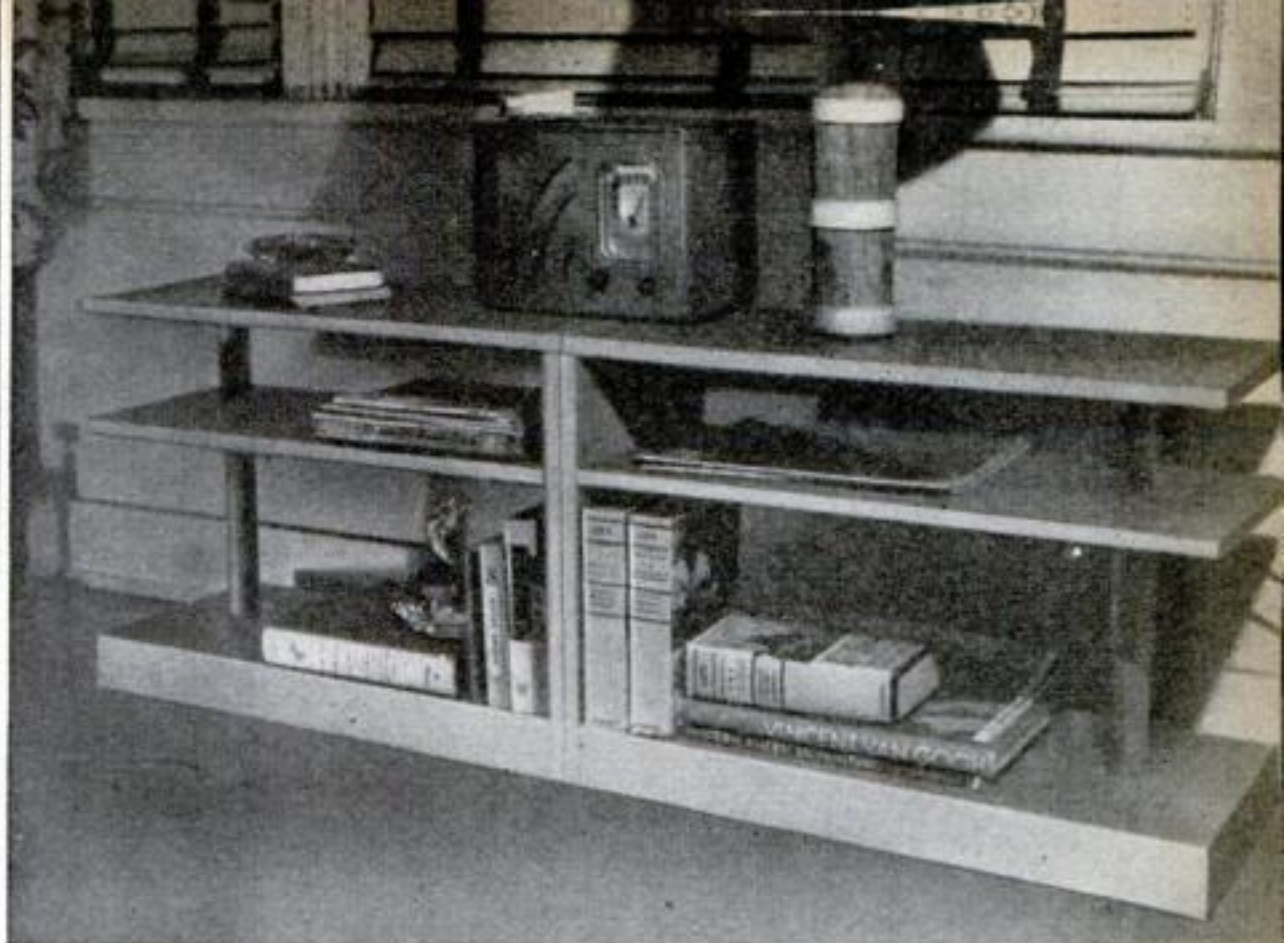
You'll take pride in displaying this decorative and inexpensive lamp. Its round base was cut from a rug pole.



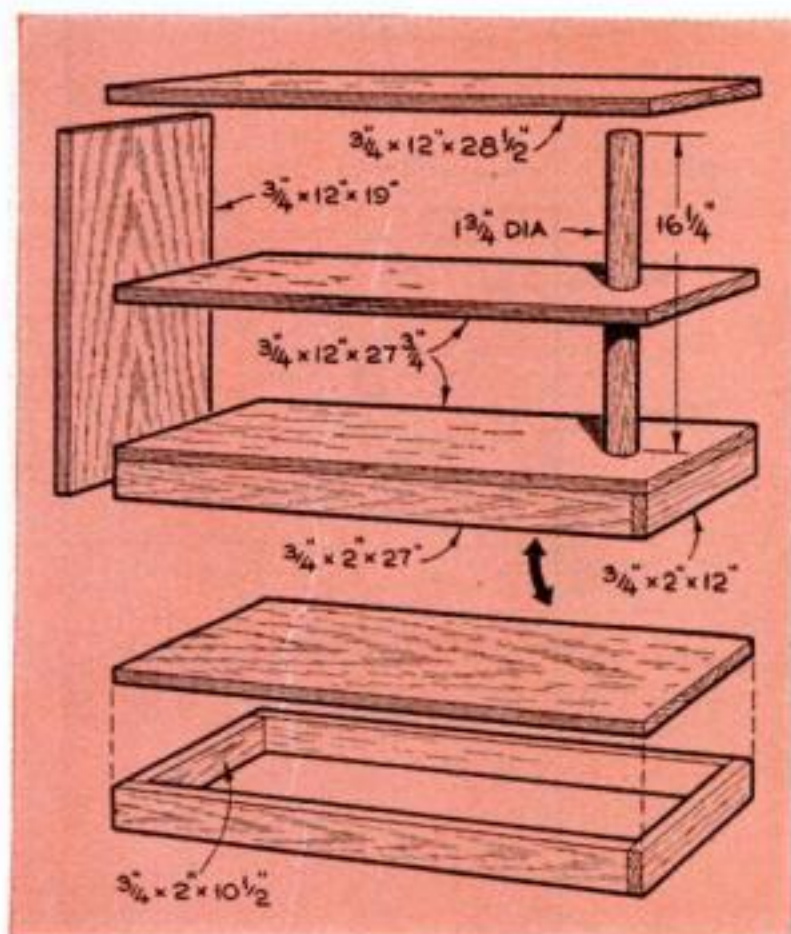
This bookshelf is nothing more than a rectangular box. But you may find it useful in several spots—above a couch, a desk, or on some wide wall space, particularly if it is given a colorful finish. Bric-a-brac placed beside the books lends added charm.



Given a good finish, this attractive end table should find a useful place among the furnishings of your home.



Several smart combinations are possible if you make two of the tables. Place them end to end beneath a window, as above, or in front of a couch as a handy place to keep books and magazines.

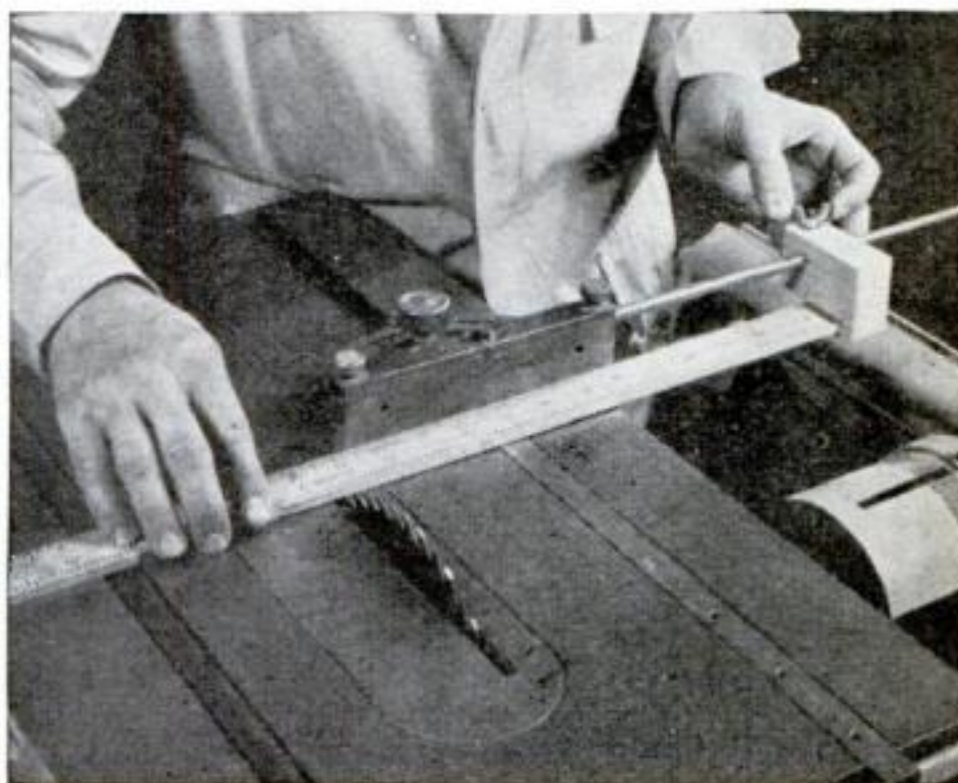
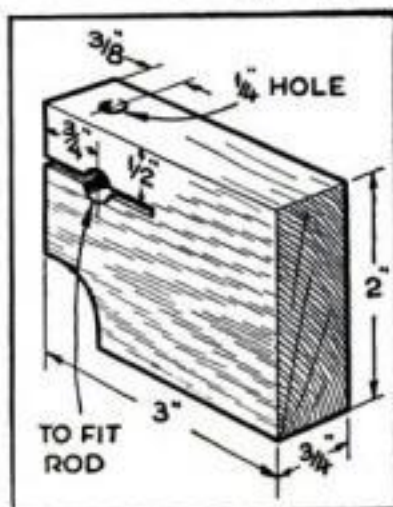


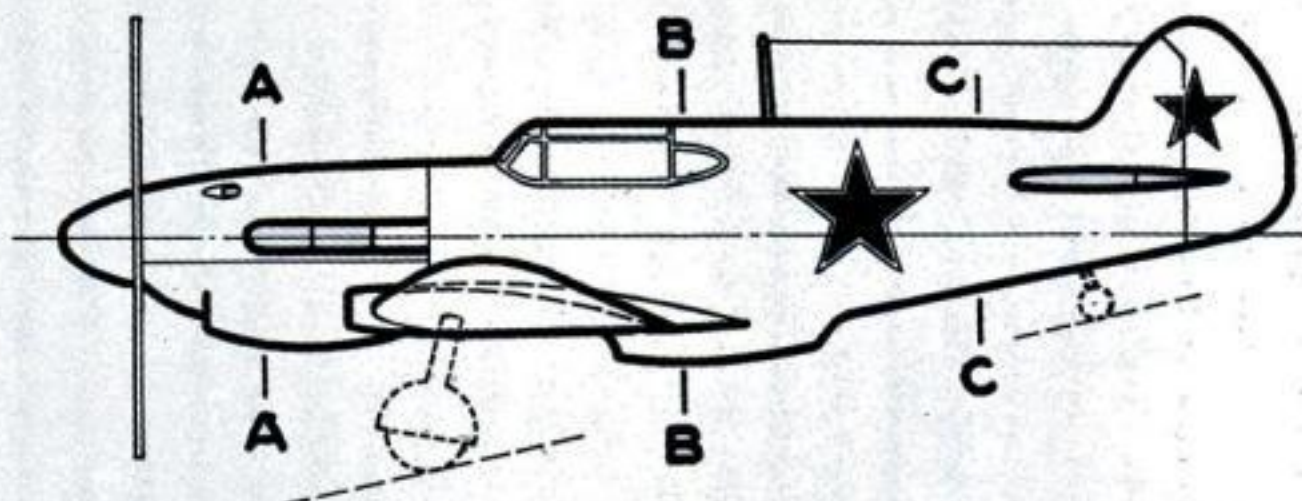
lumber, 12" wide, was used for the tables illustrated. The dimensions indicated can be adjusted to individual requirements, of course, and a square post can be substituted, if you wish, for the round one which joins the top and bottom shelves. If locating and cutting the hole in the center shelf seems too much trouble, the post can be made of two pieces. To make a smooth job, use finishing nails, countersink them, and fill the holes with putty.

To a great extent, the finish will determine the ultimate satisfaction or dissatisfaction you will feel with your handiwork. Hence, a little extra work at this stage to make certain that the table has a handsome appearance will pay dividends.

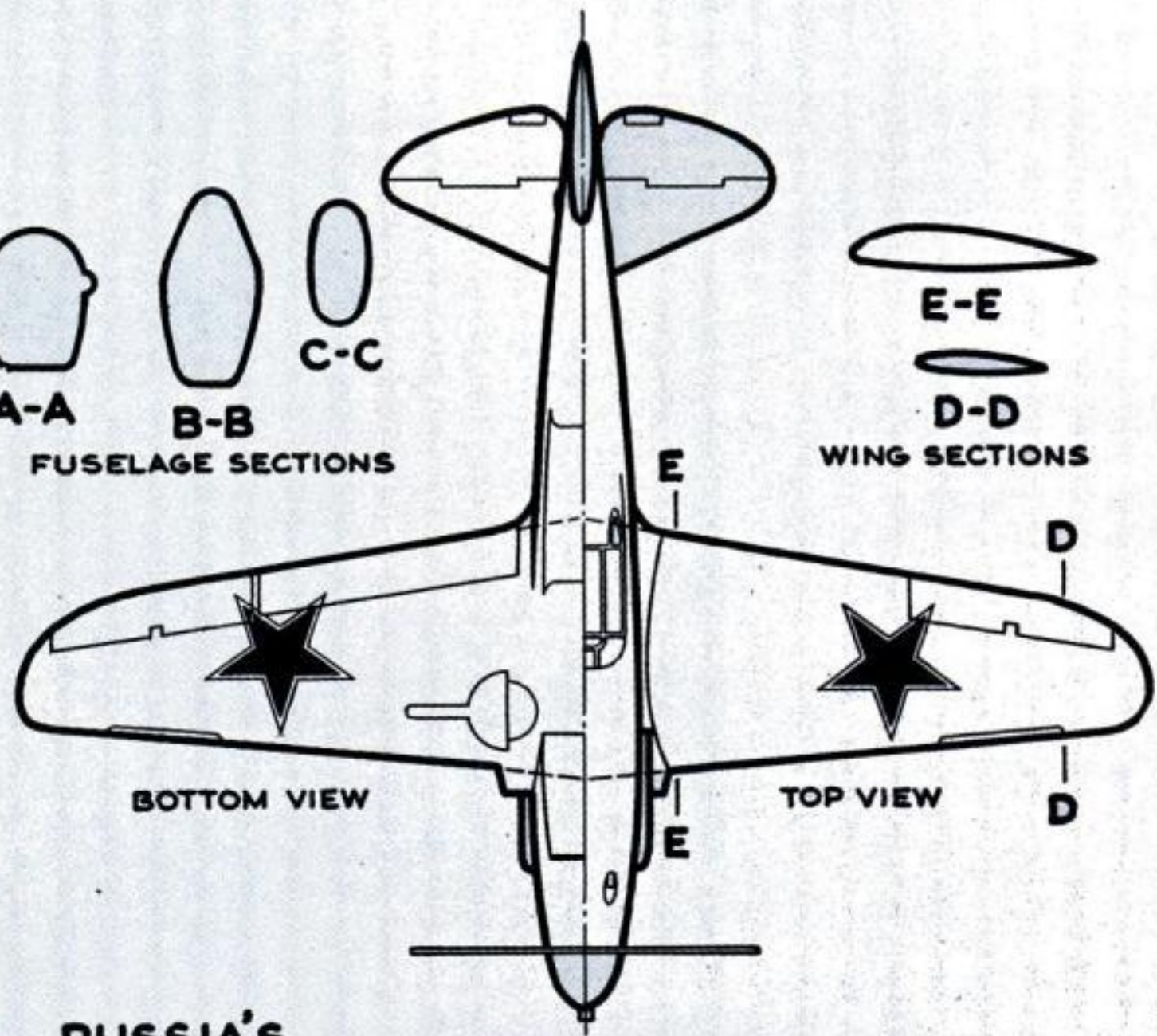
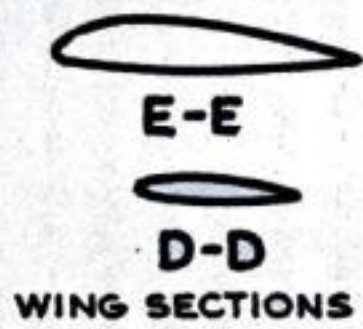
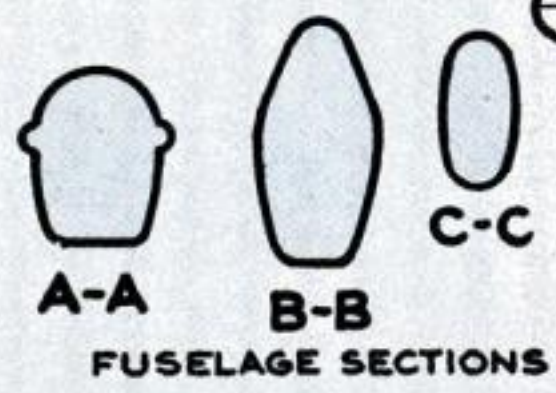
After sanding the piece extensively with several grades of progressively finer paper, give it the finish that will fit best in the room. One possibility is to use white or ivory enamel and apply colorful decalcomanias. The result should be particularly appropriate for a modern apartment. Two tables will make possible several smart and useful combinations.—JAN AND JACK HOLMES.

IDENTICAL LENGTHS of wood can be cut with ease on a circular saw if you use this jig, a steel curtain rod or piece of Bessemer rod, 24" to 36" long, equipped with an adjustable stop block. The rod fits into the usual stop-rod hole in the miter gauge. Quickly adjusted at any distance on the rod, the block is locked in position with a bolt and wing nut. The dimensions given for the block should fit most circular saws.—FRANK HEGEMEYER.



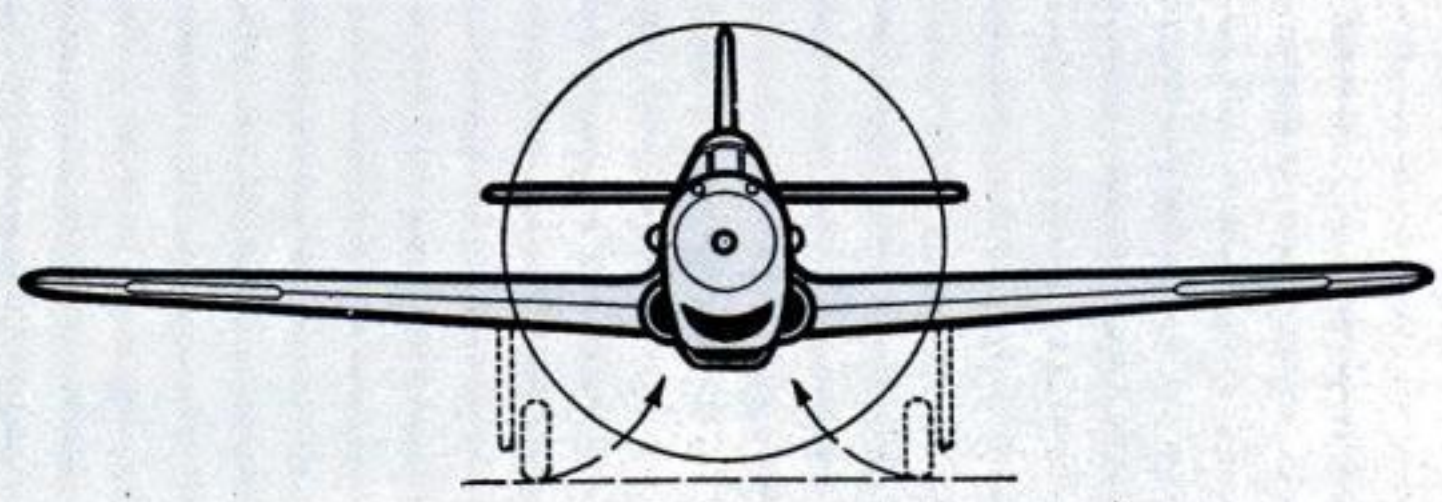


$\frac{1}{2}$



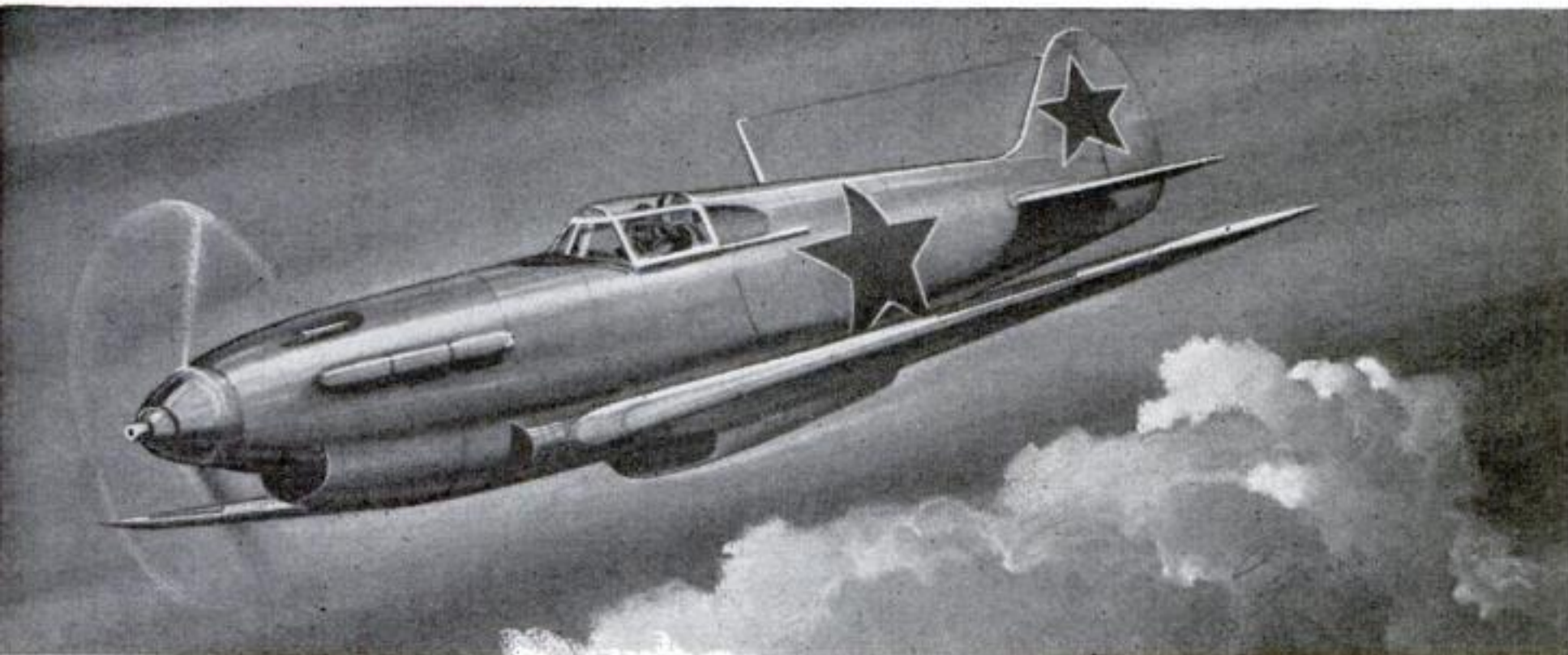
**RUSSIA'S
LAGG 3**

**PLANS ARE
HALF SIZE**



-PATRICK-

MODELING RUSSIA'S LAGG 3 FIGHTER



CONSIDERING the number of aircraft designs experimented with by all belligerents and the high rate of obsolescence of planes tested in action, the quality of the Red Air Fleet's Lagg 3 can best be described by the statement that it hasn't yet worn out. A stand-by throughout the entire European war, this fighter covered every Russian front and everywhere proved itself an expensive visitor for the foe.

Russia's shortage of metal and metal workers made it necessary to employ a composite wood-and-metal construction. A 1,200-hp. liquid-cooled engine gives the Lagg 3 a speed of about 350 m.p.h. Its armament consists of a single 20-mm. cannon in the nose and two 12.7-mm. machine guns. The plane is 29' long and has a wing span of 32'.

Because of its trim lines, modeling this plane presents no unusual problems for the craftsman. Balsa or white pine may be used equally well, and the choice depends only on availability and preference. A block of about 1" by 2" by 7" is needed for the fuselage. First draw the profile on the block and cut away the excess wood; repeat this process for the top view; and then carefully carve and sand it down to the shape called for in the drawing.

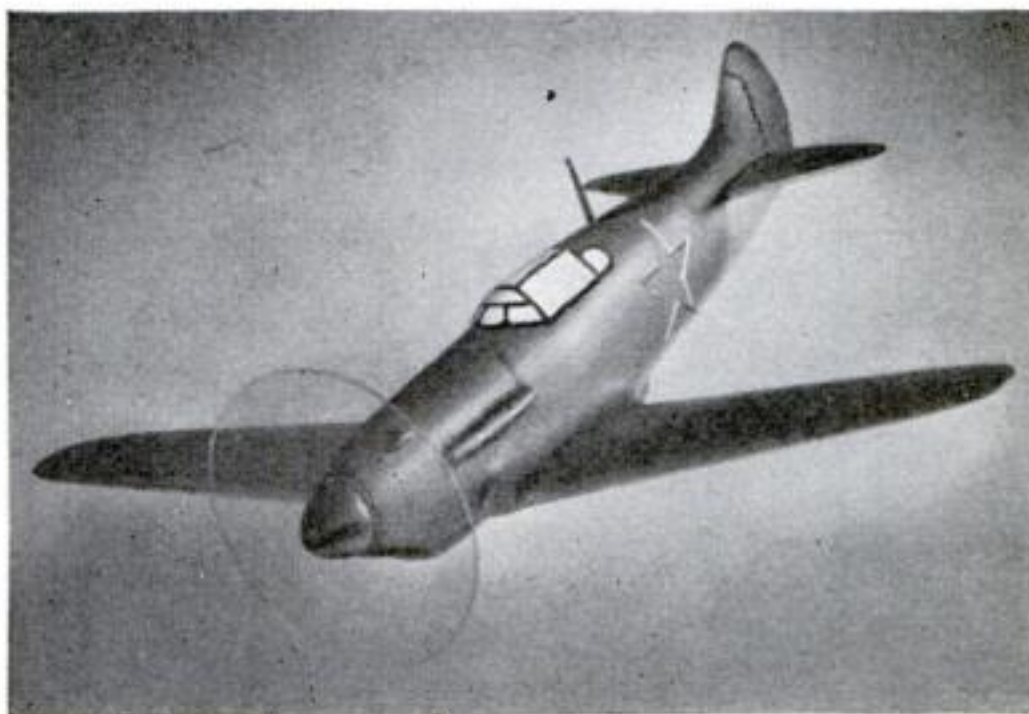
The wing should be made of another single piece. Cut a corresponding notch in the bottom of the fuselage to receive the wing and then glue it in place. Fill in the crevices with plastic composition wood. The left-hand side of the center drawing gives a bottom view

Veteran of the entire war, Russia's Lagg 3 ranks among the deadliest fighters of the Allied fleets.

of this construction. Tail surfaces, formed separately, should be shaped as shown.

Assemble the entire model before painting. Apply several coats of wood filler and sand between each coat with wet-or-dry sandpaper. The model illustrated below was given two coats of green-brown airplane dope on the upper surface and two coats of sky blue underneath. Decals of the Russian insignia were purchased at a hobby store. A whirling propeller effect is obtained by gluing a celluloid disk behind the propeller spinner. The cockpit is painted white with a fine-line black trim. All control-surface effects are obtained with thin black lines.

Proper mounting of plane models is important to the appearance of your collection. The sharp angle of this one gives an impression of flight and action.



BANTAM-SIZE FARM WAGON

Familiar Old Standby Is Scaled Down to Make a Sturdy Coaster Wagon

By EDWIN M. LOVE

HAPPY memories of days down on the farm are called to mind by this toy wagon. Easy rolling and a good coaster, it can be steered by a child with his feet; yet it is a big, husky wagon capable of hauling almost any load that can be piled on it.

As in a full-size wagon, the reach twists and permits the wheels to drop individually into ruts, but this action is restricted somewhat by the box, which has not been made flexible. The running gear is built of oak, but pine or other soft wood is suitable for the box and seat. Iron rods, which need not be of the exact sizes specified, can be picked up at a dump or wrecking yard. Mending plates and angles are sold at hardware stores.

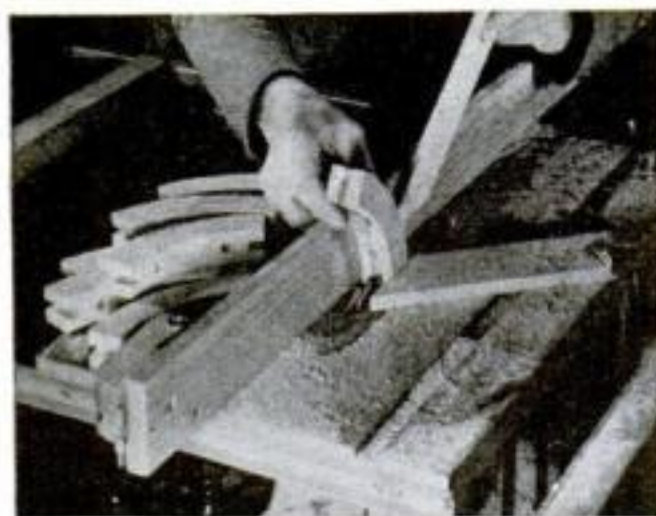
Bandsaw the wheel-felloe segments from stock at least 1/16" thicker than the finished felloes to allow for truing after assembly. Rip the spokes on a taper jig and smooth them on a sanding disk or belt before rounding the corners. Sand also the tapered ends that enter the hub mortises. The round tenons are cut with a jig and dado head.

Turn the four hubs in one piece; then, before cutting them to length, scribe pencil lines to locate the mortise ends, noting that alternate spokes are staggered 1/4". Use the index attachment of the lathe to space

the mortises. Bore two holes for each mortise and trim it to shape with a chisel. Then bore the hubs and true the ends with the aid of a wooden chuck turned to fit.

Make a trial assembly of each wheel before gluing. Put the spokes in the hub first, chamfering the ends if necessary to prevent interference when they are driven to bring the shoulders to correct distance from the hub. Number the spokes and their mortises and take them apart. Then glue the tenons into the felloe segments with plastic glue. In this way the shoulders can be driven up tight with little trouble.

Next, make an assembly jig by cutting a hole in a flat board to fit a hub, which is inserted outer-end down. Start the spokes into the hub by springing the free ends apart, and then drive the segments until they line up at equal distance from the hub with their ends touching. Place 1/4" shims under the upper spokes at the hub and clamp the segments to the jig. True the joints by cutting through with a backsaw, and then drive the spokes a little farther into the hub. If the segments are still too far from the hub, cut the joints again. When the fits are accurate, take the wheel apart, apply glue, and reassemble with the spokes shimmed to assure dishing of the wheel. Be sure that the felloe splines are short enough to enter without spreading the joints.



Wheels for this toy farm wagon are sawed out in sections. At left, segments that form the felloes are slotted for splines before being trued up.



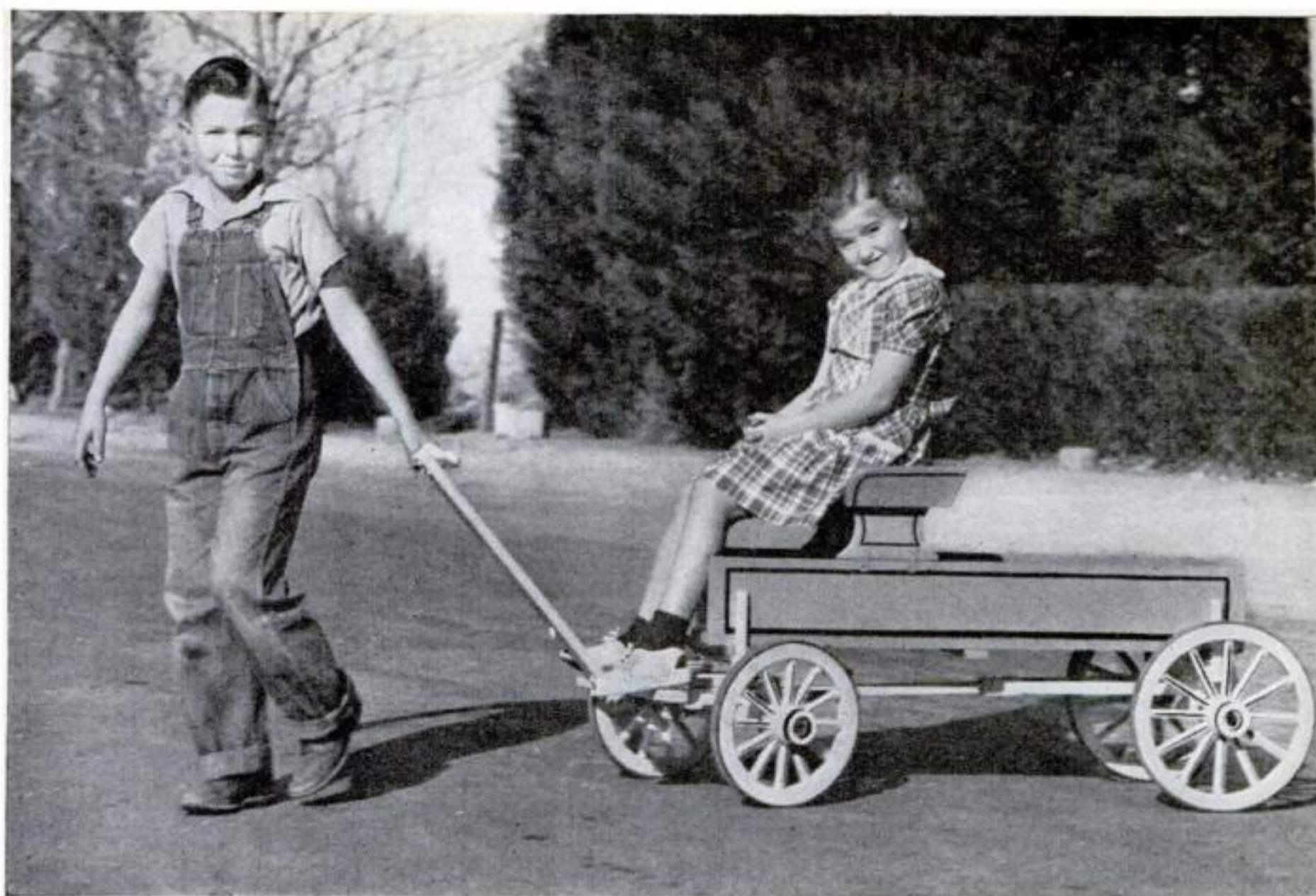
Round tenons required on the outer ends of the spokes are shaped in a jig with a dado head, as at the right.



Rectangular mortises in the hubs receive tapered ends of the spokes. An L-jig of pieces nailed up and clamped holds the hub in the drill press.



This jig is also of use when the drilled mortises are chiseled to shape, as shown at the right. Note the slight staggering of alternate mortises.



Clamp the felloe to the board and check squareness by resting a straightedge on the end of the hub and measuring the distance of the ends from the board. If one end is higher than the other, the hub leans and should be straightened with a clamp.

Bore the bushing blanks to fit the spindles, turn a slightly tapered rod for a mandrel on which to slip the blanks for turning their outside to a light driving fit in the hub, and mark the blanks for identification. The bushings should be soaked in lubricating oil or boiled in it before they are driven in.

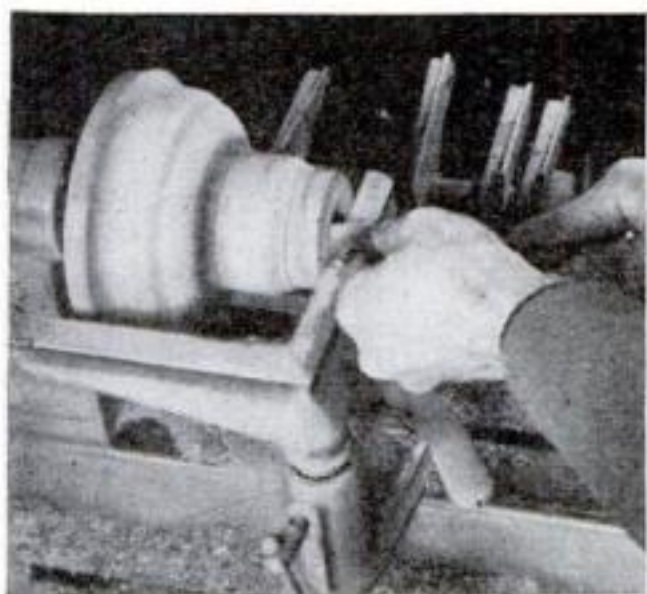
When the wheels are dry, mount them on a pivot jig and true the edges with a shaper or sander. Drive glue-coated wedges into the mortises where they are open.

Attach rubber-belt tires to the wheels with bicycle-tire cement, securing the ends with a couple of brads. After some use the tires may stretch and come off, and they will

have to be shortened and recemented. When the tires have been broken in, a few brads driven around the circumference will reinforce the cement. If you wish, you may glue a strip of heavy cloth to the wheel with plastic glue and then glue the tire to the cloth with rubber cement. Better, of course, are iron tires shrunk on while hot.

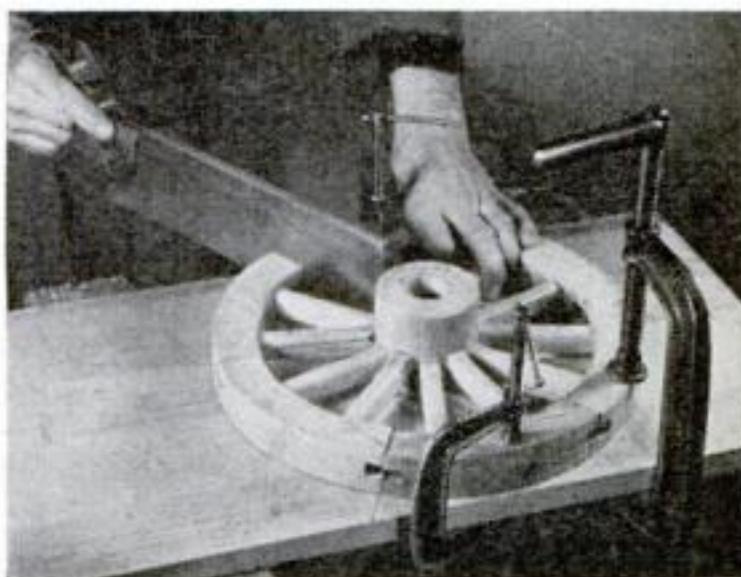
True the axle bearing surfaces by filing the $\frac{1}{2}$ " pipe in a lathe operated at its lowest speed. Turn a wooden chuck to drive the axle, ream the burr at the ends, and support the tailstock end with a metal-turning center. Use a flat mill file, keeping the teeth clean. Crown the axles by supporting them on blocks behind the spindles and pounding the centers with a hammer.

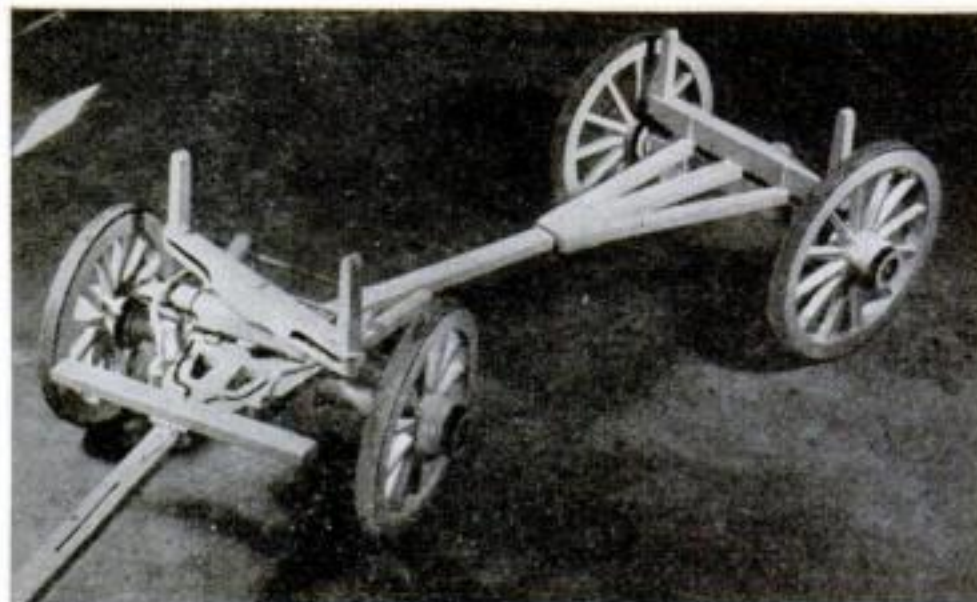
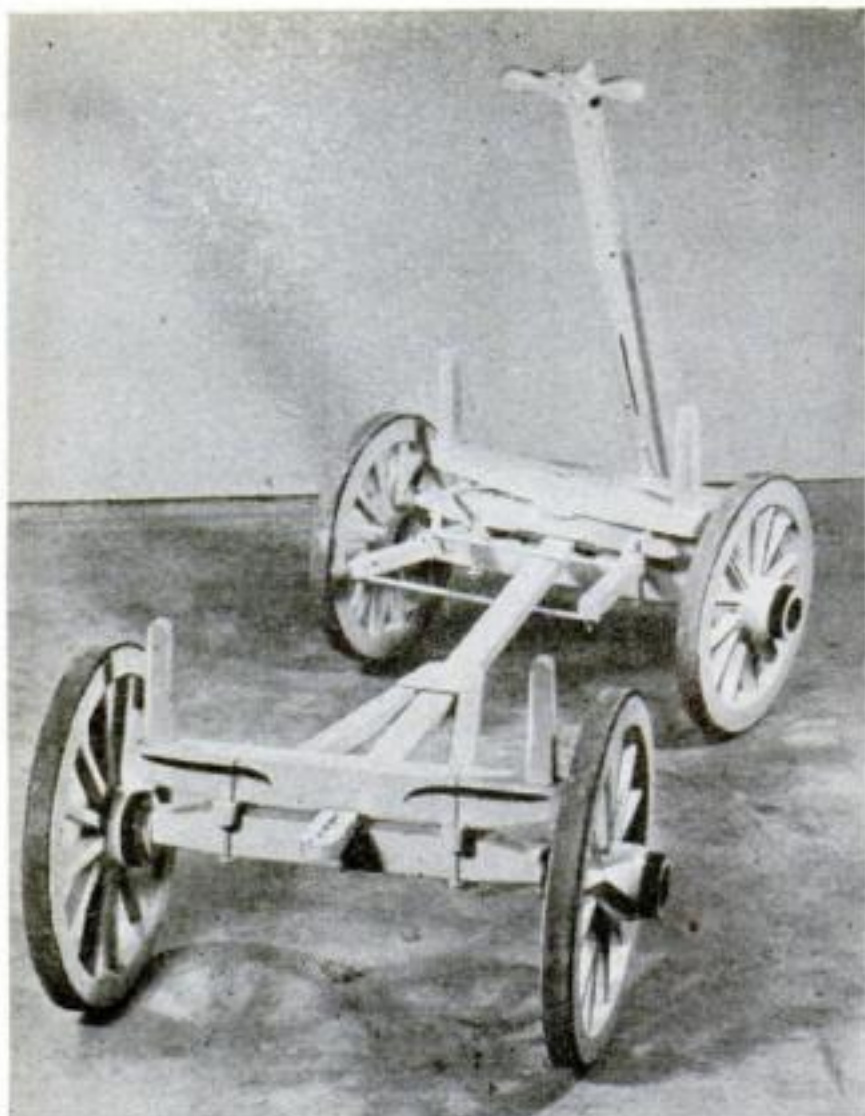
Flatten the strap sections of the U-bolts by cold hammering, being sure to measure them as they are worked, for the metal will stretch. If no threading die is at hand, bend



When boring the hubs for the axle, hold them one at a time in a wooden chuck turned to fit. The ends of each are trued before it's taken from the chuck.

Felloe joints can be trued, as at right, by sawing through them during a trial assembly and driving the segments tight.





In the assembled running gear, the relationship of parts detailed in the drawing is shown. Circle irons and sway bars take stress off the kingbolt.

Sway bars and irons show clearly at the left, as do adjustment holes in the rear end of the reach.

the bolts to fit their positions and rivet the ends over the yoke plates. Bend the ends of the circle irons and curve them a little at a time throughout their length by placing them on blocks 3" apart and hammering between the supports. Turn up the ends to fit the hounds.

Cement washers to the ends of the axletrees and hubs before mounting the wheels. The washers may be enlarged, if necessary, by filing out the holes. Smear the spindles and bushings with graphite grease or, if desired, the hubs can be bored and fitted with

grease-gun attachments to eliminate the bother of removing wheels for lubrication.

The running gear can be shortened by sliding the reach farther through the hind carriage and shifting the hind sill forward correspondingly. This shortens the turning radius and eases steering in coasting by throwing more weight on the hind wheels, but it increases the tendency to lift the front when pulling loads.

If spoke wheels require too much work, disks cut from plywood or stock glued up from $\frac{3}{8}$ " lumber, as shown in a drawing, can be substituted. Make the hubs in two sections, assemble them on bushings, and join them with glue and long screws.

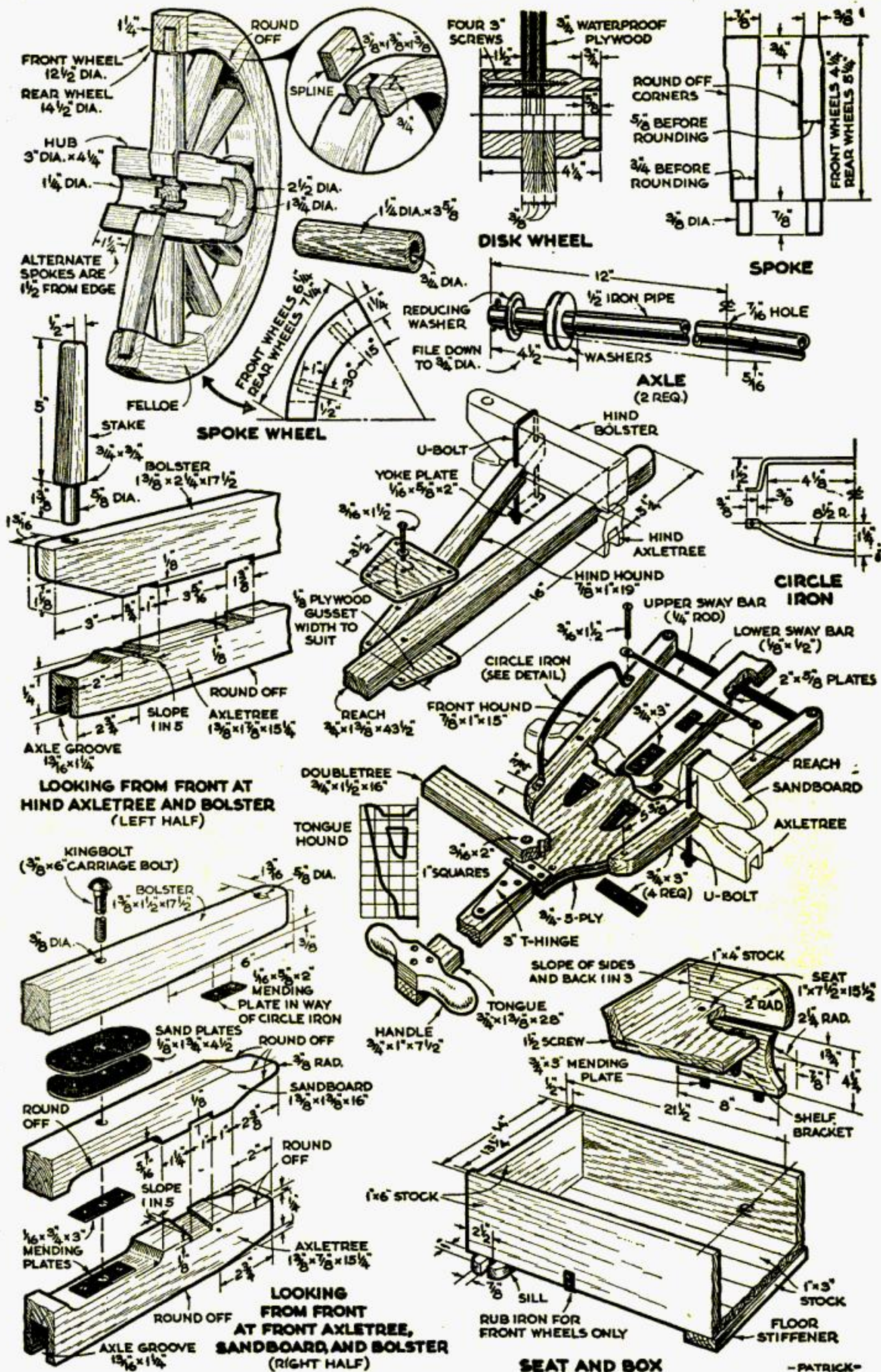
Finish the wagon with two coats of enamel, making the running gear yellow and the box and seat orange and red.

LIST OF MATERIALS

No. Pc.	Description	Stock	T	W	L	No. Pc.	Description	Stock	T	W	L
12	Front felloes	Oak	1 $\frac{1}{4}$	1 $\frac{1}{4}$	6 $\frac{1}{4}$	1	Reach	Oak	$\frac{3}{4}$	1 $\frac{3}{8}$	43 $\frac{1}{2}$
12	Rear "	"	1 $\frac{1}{4}$	1 $\frac{1}{4}$	7 $\frac{1}{4}$	2	Hind hounds	"	$\frac{7}{8}$	1	19
24	Splines	"	$\frac{3}{8}$	1 $\frac{3}{8}$	1 $\frac{3}{8}$	2	Gussets	Plywood	$\frac{1}{8}$	(to suit)	3 $\frac{1}{2}$
24	Front spokes	"	$\frac{5}{8}$	$\frac{7}{8}$	5 $\frac{1}{8}$	2	Front hounds	Oak	$\frac{7}{8}$	1	15
24	Rear "	"	$\frac{5}{8}$	$\frac{7}{8}$	6 $\frac{1}{8}$	1	Tongue hound	Plywood	$\frac{3}{4}$	7	8
4	Hubs	"	3	diameter	4 $\frac{1}{4}$	1	Doubletree	Oak	$\frac{3}{4}$	1 $\frac{1}{2}$	16
4	Hub bushings	"	1 $\frac{1}{4}$	"	3 $\frac{5}{8}$	1	Tongue	"	$\frac{3}{4}$	1 $\frac{3}{8}$	28
2	Axles	Black-iron pipe	$\frac{1}{2}$	"	24	1	Handle	"	$\frac{3}{4}$	1 $\frac{1}{2}$	7 $\frac{1}{2}$
1	Front axletree	Oak	1 $\frac{3}{8}$	1 $\frac{7}{8}$	15 $\frac{1}{4}$	2	Sills	"	1	3	16
1	Sandboard	"	1 $\frac{3}{8}$	1 $\frac{3}{8}$	16	1	Box-floor stiffener	Pine	1	3	14
1	Front bolster	"	1 $\frac{3}{8}$	1 $\frac{1}{2}$	17 $\frac{1}{2}$	5	Box flooring	"	1	3	43
8	Mending plates	Iron	$\frac{1}{2}$	$\frac{3}{4}$	3	2	" sides	"	$\frac{5}{8}$	6	43
4	" "	"	$\frac{1}{2}$	$\frac{5}{8}$	2	2	" ends	"	$\frac{5}{8}$	6	13 $\frac{1}{4}$
2	Sand plates	"	$\frac{1}{8}$	1 $\frac{3}{4}$	4 $\frac{1}{2}$	2	Seat supports	"	$\frac{5}{8}$	4 $\frac{1}{4}$	8
1	Kingbolt	Steel	$\frac{3}{8}$	diameter	6	4	Mending plates	Iron	$\frac{1}{2}$	$\frac{3}{4}$	3
4	Stakes	Oak	$\frac{3}{4}$	$\frac{3}{4}$	6 $\frac{3}{8}$	1	Seat	Pine	1	7 $\frac{1}{2}$	15 $\frac{1}{2}$
1	Hind axletree	"	1 $\frac{3}{8}$	1 $\frac{7}{8}$	15 $\frac{1}{4}$	2	" sides	"	1	4	8 $\frac{1}{2}$
1	" bolster	"	1 $\frac{3}{8}$	2 $\frac{1}{4}$	17 $\frac{1}{2}$	1	" back	"	1	4	17 $\frac{1}{2}$

Miscellaneous: 8 washers, 4 reducing washers, 4 cotter pins, 11 steel bolts (3/16" by 1 $\frac{1}{2}$ "), 3 steel bolts (3/16" by 2"), 4 U-bolts, 4 yoke plates, 2 sway bars, 2 circle irons, 1 T-hinge (3"), 2 rub irons, 2 shelf brackets, wood screws, and roundhead machine screws.

Note: All dimensions are given in inches and are finished sizes.



A black and white photograph of a small, ornate, dark-colored side table. The table has a round top and a slender, fluted central column. It features three curved legs. On the table, there is a white vase with flowers, a small white bowl, and a small white object. The background is a plain, light-colored wall.

THOMAS CHIPPENDALE, eighteenth-century master, is usually thought of as ornamenting his furniture with elaborate carvings, but I have found this simpler style, with some few adaptations, particularly suitable for the modern American home. Missing besides flutings and carvings on the post and feet are the piecrust table top with its dished-out effect and the intricate "cage" tilting device which has here been replaced with a less intricate unit.

The legs are shaped to fit against the post by having their contact surfaces hollowed against a sanding drum of the same diameter as the post. This drum can be turned in the lathe, and the sanding may be done by

sliding the mortised leg along the tool rest. The legs are assembled with splines as in the drawing and are secured by gluing under clamp pressure. If a joint does not seem tight enough, a dowel may also be driven in at an angle for additional strength.

One of the drawings shows the tilting and locking device in an upside-down position.

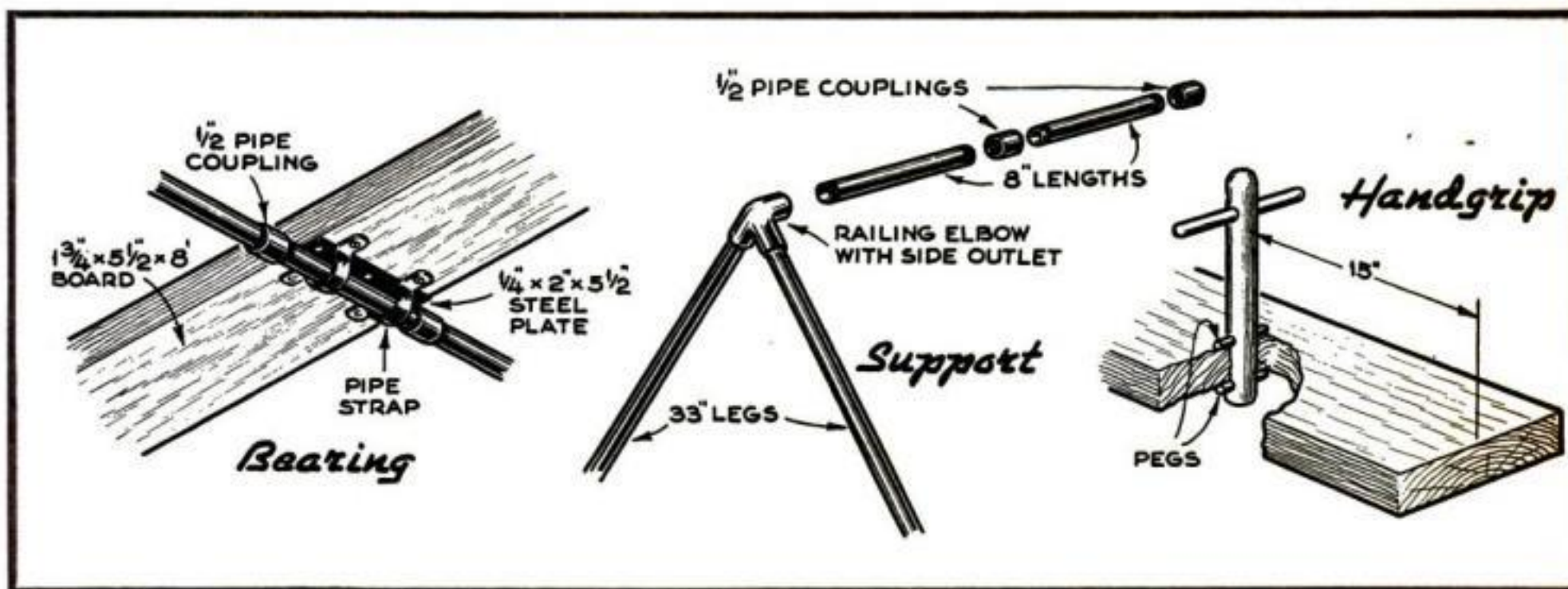
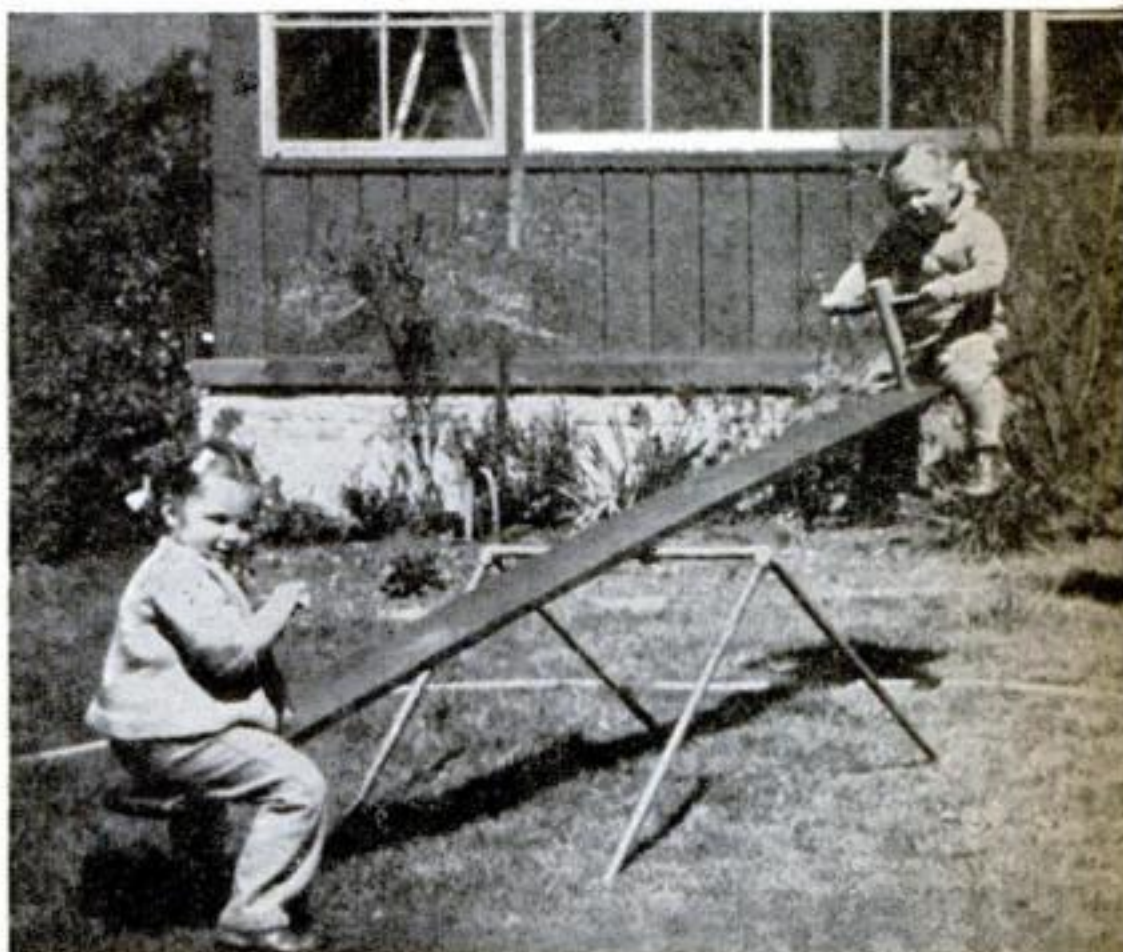
Two cleats are screwed to the bottom of the top, and a square block, which will move easily between them, is screwed to the post. For a hinge two screws are driven through the cleats into the block exactly opposite each other but off-center in the block. They should not be too tight in the cleats. A swivel key locks the table top.

Back-Yard Seesaw with Pipe Support Is Safe for Small Children

UNWELCOME spills are next to impossible on a safety seesaw held to its fulcrum with pipe straps and fitted with upright handles to which even the littlest tots can cling while riding up and down with the board. The assembly is so light that two children can move it around to suit their fancy.

Short lengths of pipe assembled with two side-outlet elbows and two couplings that prevent side slippage form the fulcrum. The bearing is made with a steel plate and two pipe straps, as shown in the drawing. It can be attached to the teeter board either at the center, if the children are nearly the same weight, or off-center for those whose size differs greatly.

The hand-grip uprights may be large doweling or square stock rounded by plane or in the lathe and held with pegs. —KENDRICK M. MARTIN.



C-Clamp Serves as Handle for Hand-Scraper Blade

DRAWN tight on a hand-scraper blade, a large C-clamp provides an excellent grip. You may even find it takes greater pressures, makes smoother strokes, and is less fatiguing than some of the handles devised for the purpose. —R. M. WOODBURY.



With the first gusts of an approaching squall, these becalmed sailboats nose automatically into the wind, the result of sufficient weather helm.

Another advantage of weather helm is evident in working to windward, as with the craft shown at the left. Moderate weather helm is always a big help, but too much can make sailing a nuisance.

SAILING BALANCE... SAFETY VALVE

IF YOU HAVE TO FIGHT THE TILLER, YOUR BOAT LACKS BALANCE

By Elon Jessup

WHAT your sailboat does when you let the tiller swing free goes far to show whether she's a safe or a risky craft. If the boat noses directly into the wind when you release the tiller, then you have little to fear, for a sudden gust will turn your bow to face it and the next gust can't catch you broadside. But if you are kept constantly fighting to head toward the wind, you are in danger of having your bow turn leeward the minute you let the rudder swing free or lose steerageway, and there real trouble begins.

In the first instance, your boat is probably properly balanced; in the second, it is decidedly not. A boat that noses automatically into the eye of the wind is said to possess weather helm and, no matter what else may be wrong, it is at least safe in this regard. One that heads the other way has lee helm, and this—except with

planing racing scows—is always a disadvantage. Corrections can be made for lee helm, as they can also be for excessive weather helm.

Too much weather helm makes steering difficult and checks progress; it makes you battle continually to keep the boat from coming into the wind and takes the fun out of sailing. All you need is just enough weather helm and no more. A mere touch on the tiller should be sufficient to keep you on your course, but at the same time you should be able to count on your boat heading into the wind automatically whenever you are forced by some necessary task to let the tiller go. In addition to being dangerous, lee helm also takes the joy out of sailing. It keeps you constantly pressing the tiller to stay on your course.

Balance is the perfect working relationship between sails and hull. When a boat has either lee helm or excessive weather helm, it means the hull and sails are out of



Originally the rudder of the Mae Win shown above ranged high above water, as does the same "barn-door" type on the Tad at right. But while this was fine for the Tad, as indicated by the gentle touch on the tiller, a better balance was achieved for the Mae Win by lowering the rudder and passing the tiller through a hole in the transom.

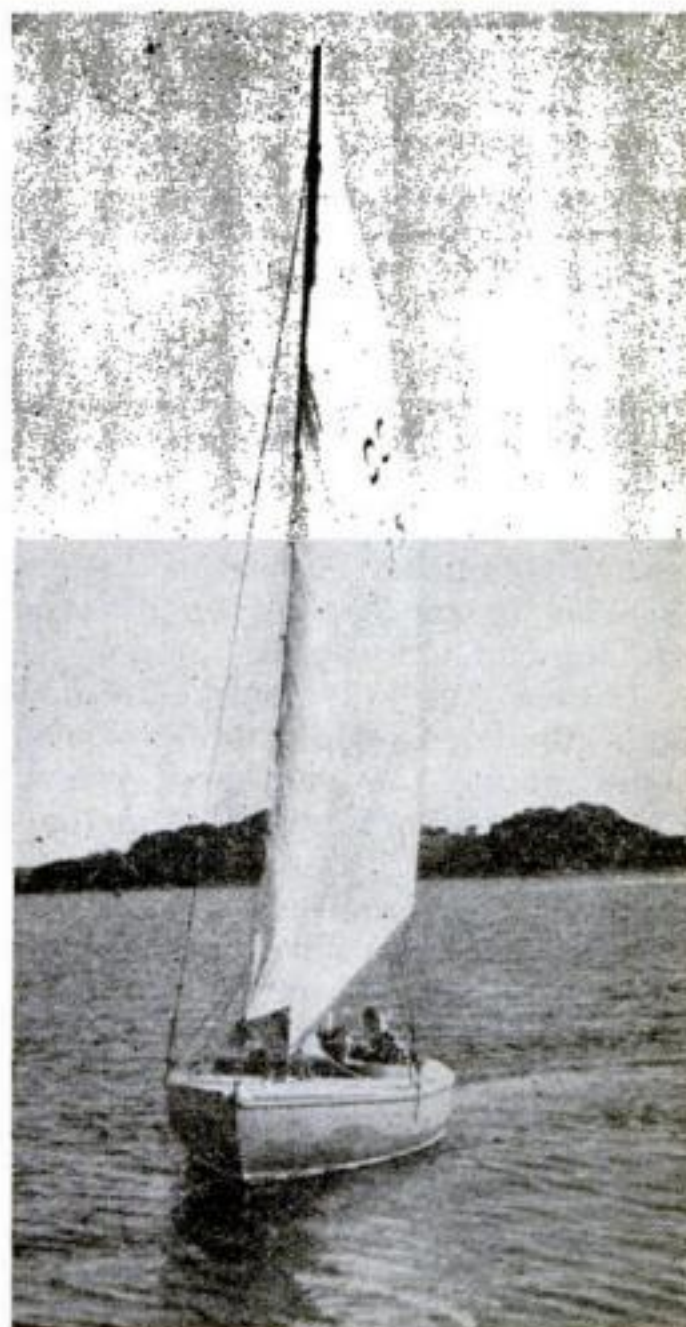


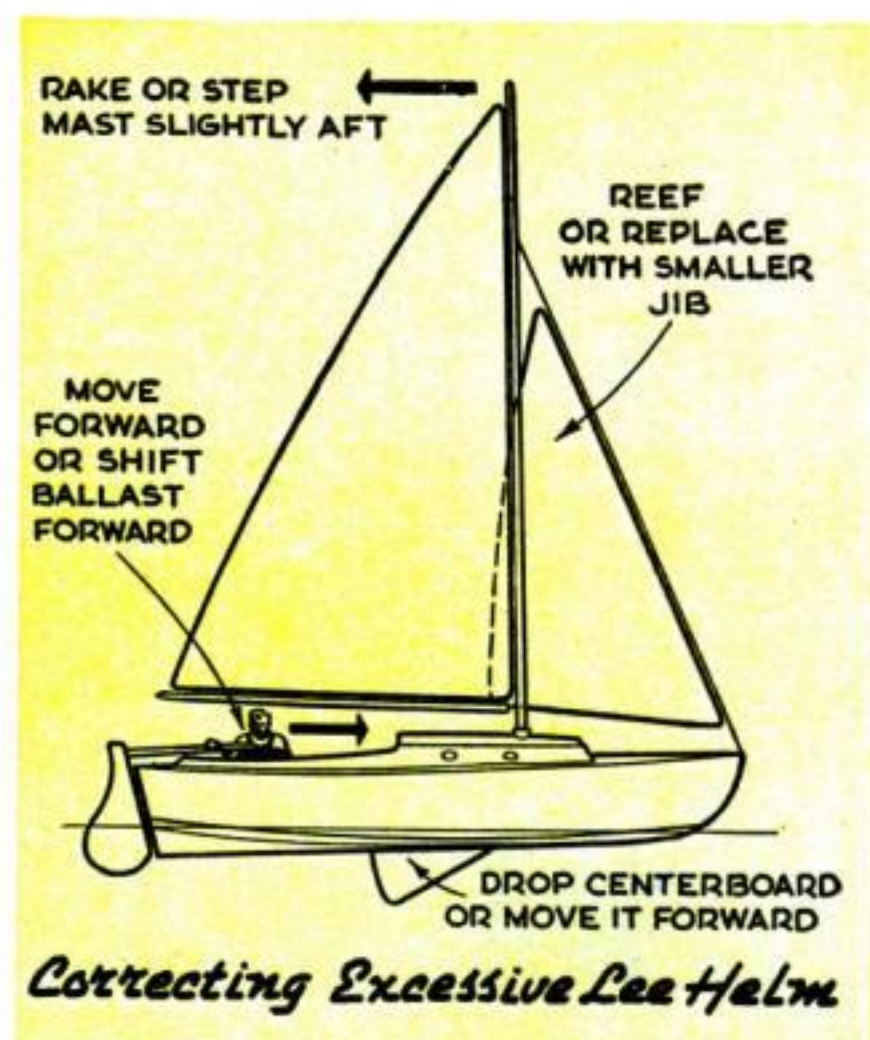
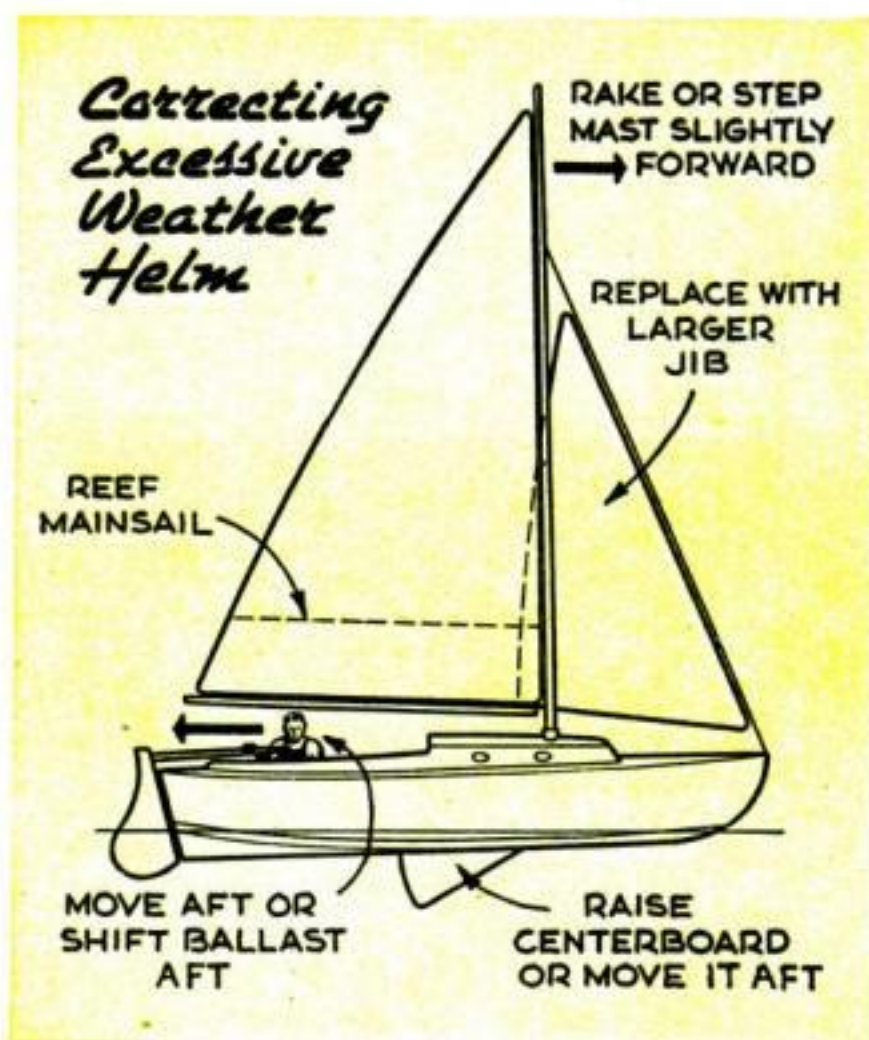
OF YOUR BOAT

balance. This is clearer when you understand that the hull has a center of lateral resistance, commonly abbreviated CLR, and the sails a center of effort, called CE. The former is the center of resistance against the sideways movement of the hull through the water; the latter is the center of effort made by the wind against the sails. Balance combines resistance against water with utilization of the force of the wind.

The center of lateral resistance is located somewhere amidships in the lower part of the hull. Theoretically neither the bow nor the stern would turn if you made a line fast at this point and then hauled away. Actually the point is subject to constant change depending upon the heel of the boat, her speed, the size of the waves, and many other factors. Theoretically the center of effort is located on a triangular sail at the intersection of lines run from any two corners to the center of the opposite sides. Actually it also is subject to shift, for a sail doesn't remain for long in any given position and

When a sailboat promptly heads up into the wind with its rudder swinging free, it can be rated as a safe boat. This is the effect of balance in relationship of hull and sails.





it heels with the breeze at varying angles.

But every boat starts with a definite plan, and yours, if it was designed by a competent naval architect, was built and rigged with a specific if somewhat theoretical relationship between CLR and CE that should work best for that particular boat.

It is customary to place the CE forward of the CLR, usually 3 to 10 percent of the load waterline length depending on the hull and the type of rig. If the CE is too far forward, you get lee helm; if the lead isn't enough, excessive weather helm results.

You'll know soon enough by the amount of work required in sailing whether performance is the best that can be expected. If it isn't, you'll want to know why. Assuming your boat was designed correctly, you can probably trace poor performance to a change in the original rig, such as from gaff to jibhead. Liberties taken with the keel or in changing to a different kind of rudder can also upset balance.

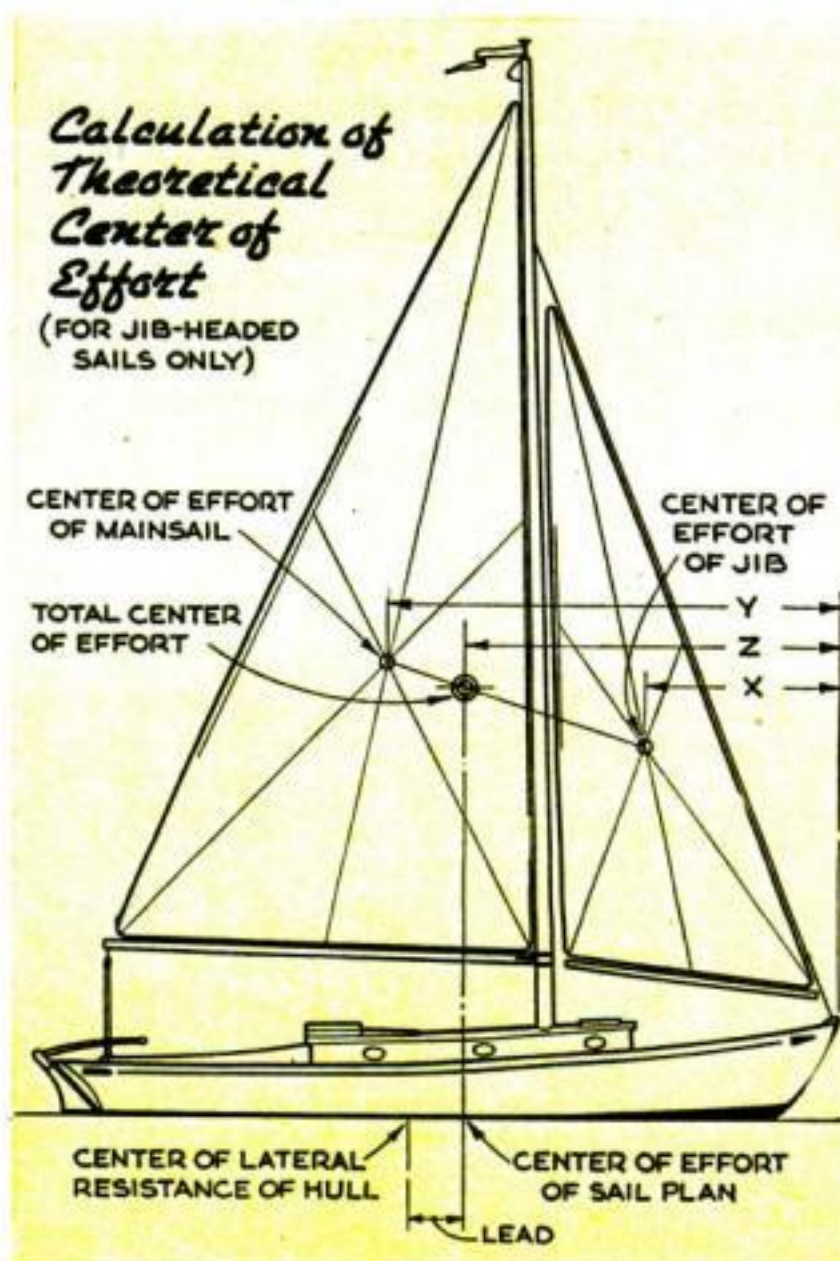
Logical cures are suggested in the drawings above. If you have excessive weather helm, move the center of effort forward. One way to do this is to shorten the mainsail by reefing. Another is to hoist a larger headsail. Still another is to move or tilt the mast slightly forward.

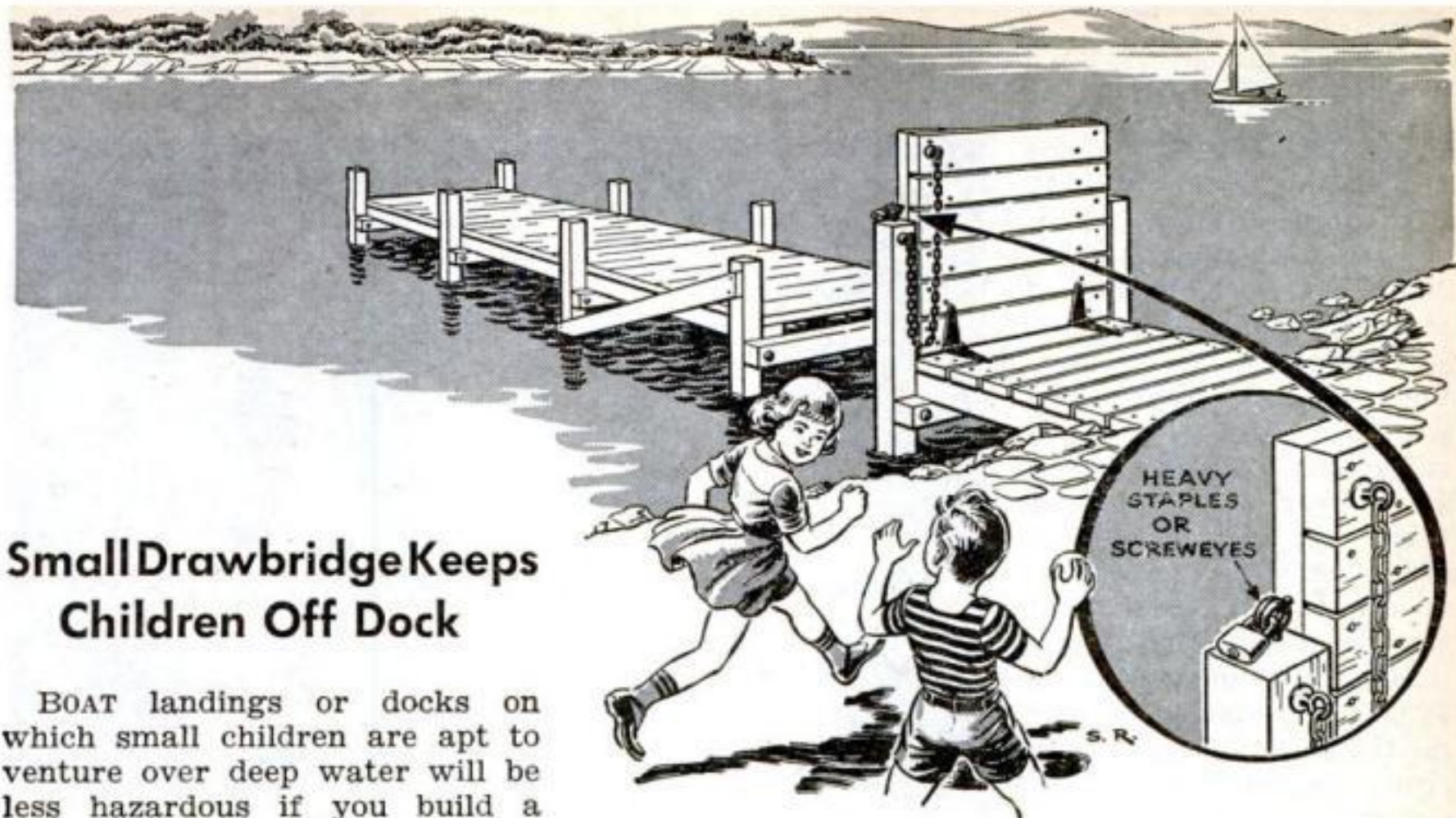
Lee helm is corrected similarly by moving the CE aft. You may increase your mainsail area, reduce headsail area, rake the mast aft, or, if you have a centerboard, drop the board all the way down.

In many cases balance of a small boat can be corrected instantly by moving ballast—human or other—forward or aft. When ballast, acting on the CLR, is moved

aft, the result is essentially the same as moving the CE forward; when it is moved forward, the CE is in effect moved aft.

Occasionally an entire centerboard will have to be moved or altered or a structural job may be necessary on the keel. But balance will have to be seriously off to demand such measures. Often enough for lee helm you need only to have a shipmate move a little forward, or to reduce weather helm have him move aft.





Small Drawbridge Keeps Children Off Dock

BOAT landings or docks on which small children are apt to venture over deep water will be less hazardous if you build a drawbridge near the shore. Such a bridge can be made by hinging a 3' section of the floor on the shore side so that when it is raised and locked to a post, children are blocked from going beyond a point where the water is more than a foot or two deep. A rope or chain, attached as shown in the

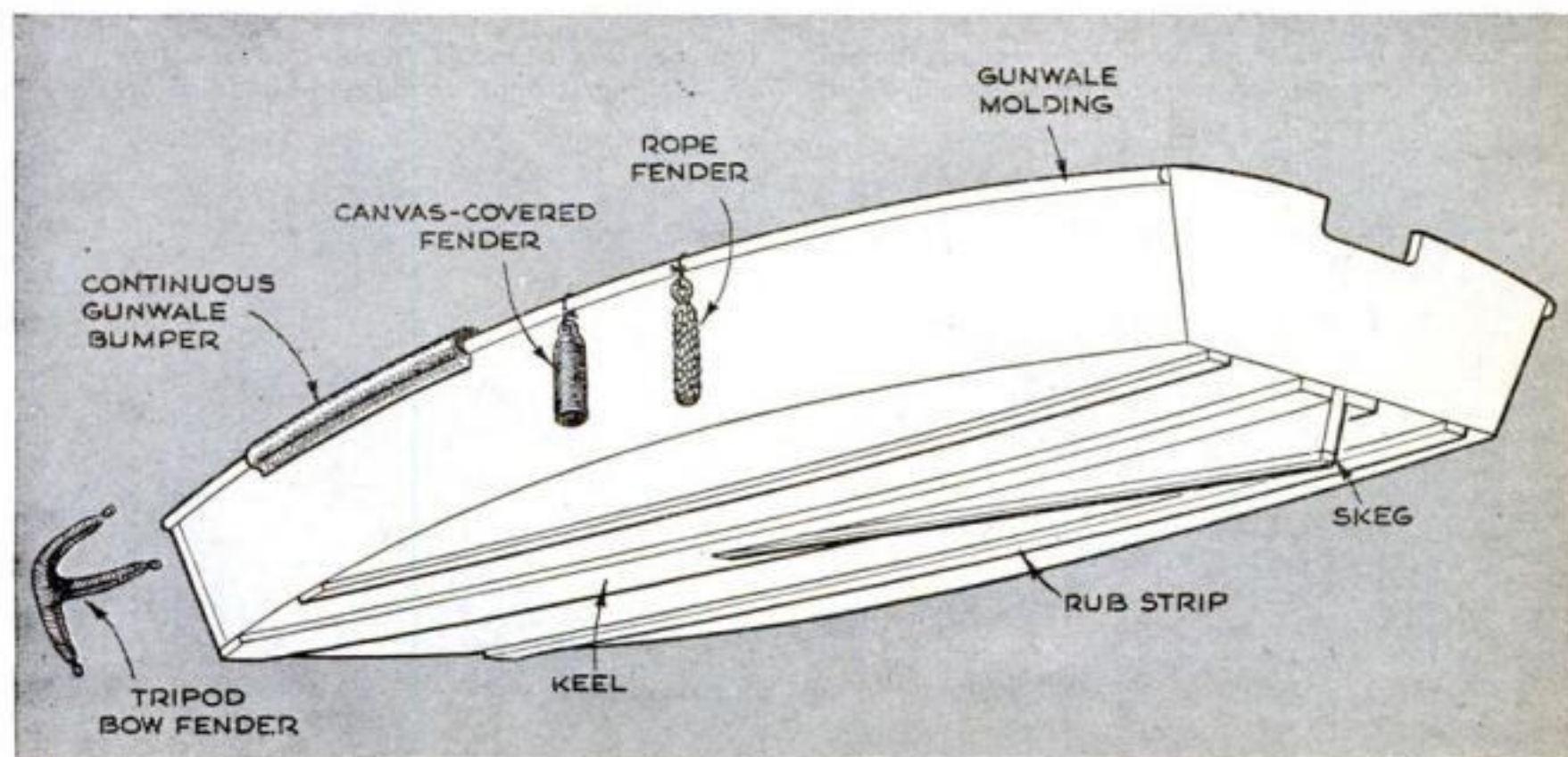
accompanying sketch, facilitates raising the bridge. Heavy staples or screweyes that come together when the bridge is upright form a place for a lock. Diagonal braces placed between the outer piles help keep the dock firm.—RALPH S. WILKES.

Protection Against Chafing Adds Years to Life of Small Boat

YOU MAY double, or even triple, the useful life of a small boat if precautions are regularly taken against chafing of the sides and bottom. Such wear causes serious damage, particularly when the boat is used constantly. Fenders that can be hung over the side are a virtual necessity if the boat is kept in a crowded anchorage or landed at a pier. These may be made of rope, or of canvas that is filled with cork, rubber, or kapok.

Another good chafing safeguard is a continuous bumper installed over the gunwale molding. A tripod bow fender is useful in some circumstances. Don't forget that discarded fire hose fastened around a pier or float will protect boats that land there.

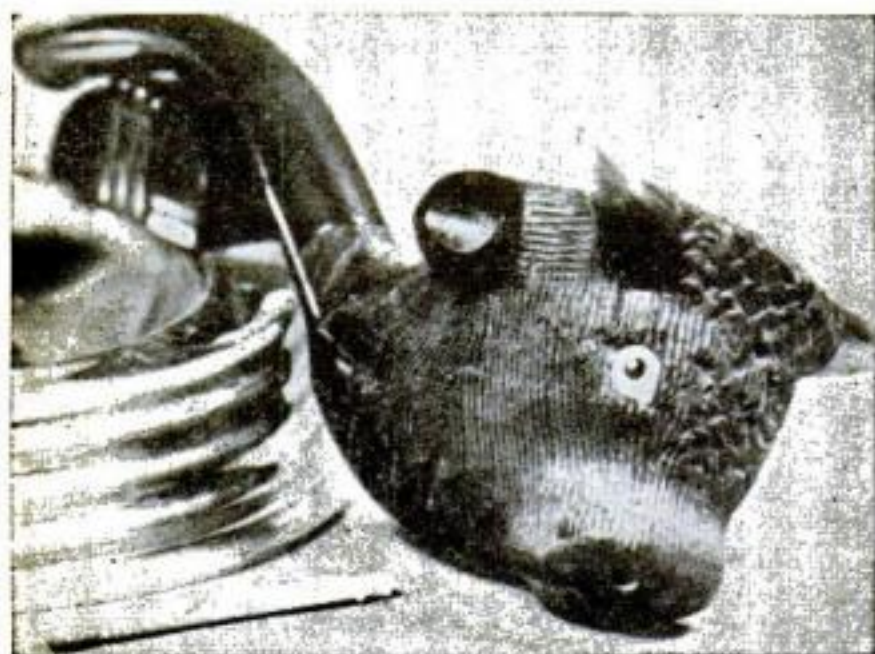
If you must drag a boat up on a rough or rocky beach, it should have a keel or skeg and as many rub strips as are needed for protection.—WILLARD CRANDALL.



Pipe Smoker's Pipe Dream

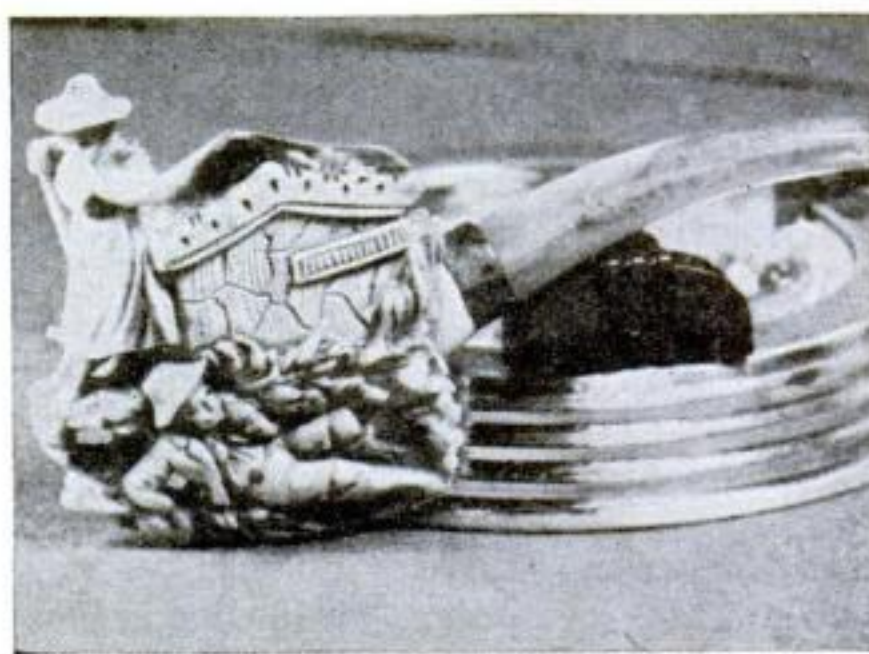
IMAGINE making a choice from a collection of 347 pipes each time you wanted to smoke! At last count, E. T. Fredrich, of Seattle, Wash., could do just that. He began buying pipes 30 years ago while he was a tobacco salesman and has been at it ever since, picking them up in junk shops, at corner tobacco stores, or wherever he could find a type he did not have.

His collection, valued at \$4,000, includes specimens of the pipemaker's craft from Austria, Australia, Germany, Italy, England, and the United States. At right, Fredrich examines a fluted bowl.



Fine craftsmanship abounds in Mr. Fredrich's pipe collection. This bull's head is an Italian briar.

And here is the head of John Paul Jones, famous U.S. Navy commander, carved from French briar.



A delicate Swiss meerschaum turned out by a 19th century craftsman is highly prized by collectors.

This bowl is a man's head, and the hair, raised on a hinge, stands on edge while pipe is smoked.





Pins with scoring
feature add a twist
to an old favorite

By
MYRON FLEISHMAN

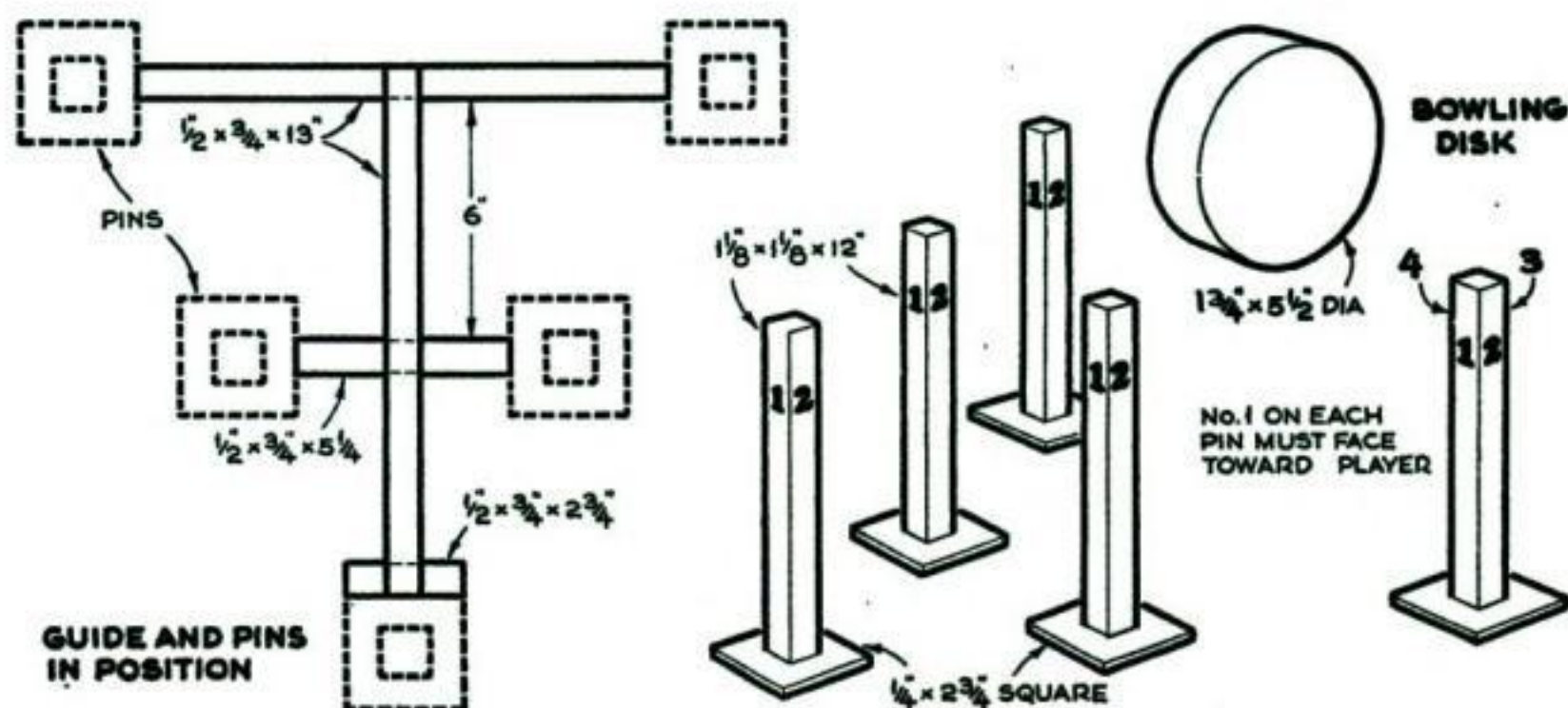
Disks Are Bowled in This Lawn Game

MANY of the thrills of bowling are combined with outdoor exercise in this game played with two bowling disks and a set of five square pins. Two or more contestants can take part, and the game itself is as suitable for the small city lawn as it is for that on suburban or country property. It can be played on a much smaller plot than that required for most outdoor games.

The disks are best turned in the lathe; but if a lathe is not available, it is still possible to saw them out by hand and round them with a rasp and sandpaper. This takes time, but with care a pair of disks can be shaped to roll straight and smoothly on a lawn or driveway. The pins are square stock, cut to length, sanded, fitted with

square bases, and numbered 1, 2, 3, and 4 on the four sides. A guide made to the dimensions shown is a help in setting up the pins quickly. Always set them up with the No. 1 sides facing the players.

Each player rolls from a preset mark 20' to 30' from the pins. He takes as his score the number showing on the upturned face of the pins he knocks over with his two disks, adding 10 points if he bowls them all over with his first shot or five if he knocks all down with two shots. No second shot is needed, of course, if he gets all the pins with his first. Ten such double tries for each contestant, with the play rotating, will make an interesting game. Total the ten scores to determine the winner.



STEEL...

KING OF SHOP METALS

Drill Rod or Cold-Rolled? High Carbon or Low? Here Are Facts to Help You Pick the Right Steel for Any Job

By WALTER E. BURTON

STEEL is the king of metals in most shops. If you know how to choose and to work the steel you want for a particular job, you will have licked one of the most persistent of the machinist's problems.

Fortunately it is not necessary to learn all about the dozens of varieties of steel in order to meet the demands of the practical shop; a very few types will suffice for nearly every need.

To understand the basic properties of the metal, we should glance quickly back to the humble ancestor of all steel—iron. Steel is produced from iron when carbon is added in such a way that it becomes part of the metal structure rather than an accretion of cinder or slag. The addition of carbon, however, is not the sole distinction. Cast iron contains around 3 percent to 5½ percent carbon in the form of uncombined graphite flakes, while in steel all of the carbon is normally combined with other elements, and the carbon seldom exceeds 2.2 percent.

Iron cannot be hardened, but steel can, and the amount of chemically combined carbon that is added determines how much hardness can be produced by proper heat treatment.

Wrought iron, such as makers of artistic lanterns and stair bannisters might use, is soft, malleable, and contains practically no carbon other than bits of slag. A wrought-iron bar has a fibrous structure somewhat like wood, and can be split parallel to the "grain."

The kind of true wrought iron that used to be so common is comparatively costly to produce from pig iron. Consequently the "wrought iron" you get hold of today may, in reality, be a form of busheled iron made by heating iron and soft steel scrap together and rolling or squeezing it to form bars or other shapes.

True cast iron is usually made by melting pig iron together with scrapped castings; it has a higher carbon content than steel and, although it is hard, it is not malleable at any

temperature. It is shaped by being heated to a liquid state and poured into a mold. Machining the hard shell of cast iron is particularly difficult, so it is usually a good idea to allow extra material in the pattern so that the first cut can be made deep enough to get under the scale. Further heat treatment will produce a kind of hybrid cast iron just as strong as the original but sufficiently malleable to be bent and twisted without breaking.

A very similar metal is a high-grade cast iron made by adding some scrap steel to the molten mass. The resultant material is known as semisteel and has greater mechanical strength than cast iron.

Ordinary steel is a malleable union of carbon and iron. Its hardness in the annealed state can be increased by heating it to redness and quenching it, by plunging it into water or oil. The greater the carbon percentage, the greater the strength of the steel and the harder it can be made. The carbon content of steel is expressed in "points," each point being equal to .01 percent. Thus, a steel with 0.15 percent carbon is said to have 15 points; 1 percent carbon is 100 points.

When carbon percentage is low, heating and quenching will not harden ordinary steel to a point where it is useful for such things as cutting tools. Low-carbon steel, therefore, is chiefly employed in making shafts, structural members and any one of thousands of other items in which hardness is not essential. But the same low-carbon steel containing, say, 15 points carbon, can be surface-hardened, or casehardened, by one of several treatments. Carburizing is the most common of these and consists of baking the steel in a loose compound of carbonized granules until some of the carbon molecules are transferred to the outer shell of the metal. Casehardened steel, having a hard surface over a soft but tough core, is well suited to the manufacture of dies, gears, engine parts and similar articles that must be resilient enough to resist breakage and yet be able to withstand much surface



abuse without wearing away or losing shape.

Casehardening is a handy procedure because it enables you to machine tools in a malleable and workable steel before hardening the shell of the finished product. A project of this sort is illustrated by the pictures at the top of page 174.

Steel with a carbon content ranging from about 55 to 70 points is known as medium carbon and is used for making such tools as hammers, garden implements, rivet sets and peens, chisels for masonry, setscrews, and dies.

High-carbon steels cover the span between 70 and 120 points; they are used to make files, wrenches, punches, vise jaws, lathe centers, cutting bits, and the like. The lower carbon steels in this group are preferable when considerable toughness plus some hardness are required; the higher carbons are employed when it is desirable to reverse the emphasis.

To obtain maximum hardness in cutting edges, steel having a carbon content of 120 points or more is used. This span is known as the very-high-carbon range, and steels of this order are made into tools for working such materials as brass, hard rubber, and wood. Reamers, files, and razor blades

are also commonly made from ultrahigh-carbon steel.

For the average shop, carbon-steel drill rod is a basic material. From it you can make all sorts of useful tools—punches, dies, chisels, and other things requiring considerable hardness and reasonable toughness. Drill rod usually ranges around 120 points carbon and is available in handy lengths ground to extremely accurate diameters.

Heat treatment of carbon steel is not difficult. In most shops the chief drawback is the lack of adequate temperature-measuring facilities, but this can be partially overcome by working from color indications. The table given at the top of page 175 shows the surface colors that carbon steel will assume at various tempering levels. In using such a table it is important to make due allowances for specific differences due to variations in carbon content, light, visual reactions, and so on. There is considerable leeway for experimentation, however, since most steels can be tempered repeatedly. After a few trials you will become familiar with your own scale of color values.

If you want to work a piece of steel that has already been hardened, you must first

anneal or soften it. This can be accomplished by heating the steel to cherry redness and allowing it to cool slowly. It can either be left to cool with the furnace, or it can be buried in lime or fine sand so that the heat will escape slowly.

Forging is a common way of shaping knife blades and other tools. Heat the steel to bright redness; then hammer it to shape, reheating every time the steel loses its redness. Hammer the steel so that it is compacted uniformly in all directions. In forming a knife blade, for example, pound it along the edges as well as along the flat sides.

For hardening and tempering small tools you can use a torch flame directed into a pocket formed by pieces of fire brick or asbestos, such as is illustrated on page 173. A gas flame fed by a forced-air draft may also be used. For extensive forging or hardening operations, you may want to construct a small gas or electric furnace.

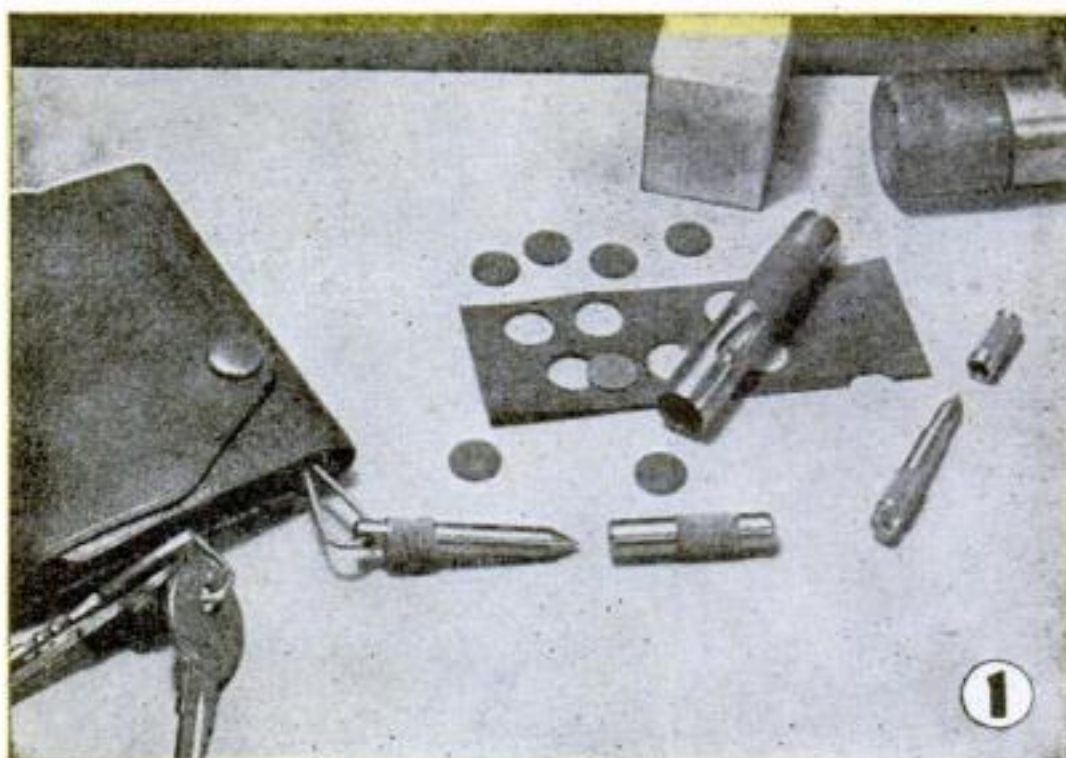
When steel is heated by an open flame or in an ordinary gas-fired furnace where the flame comes in contact with the metal, the carbon near the surface may burn out, causing decarburization and loss of hardness. The surface may also acquire a scale which is difficult to remove.

Special "atmosphere" furnaces that prevent oxidation are used in industry. Some manufacturers of steel suggest that pieces to be hardened be dipped in a saturated solution of boric acid before heating. By immersing the work in some material that keeps oxygen from striking it during heating to a high temperature, decarburization and scale are eliminated. Often the pieces emerge from quenching almost as bright as before they were heated. Molten lead and neutral salt baths are commonly used; the latter are available in mixtures that melt at various temperatures.

An additional advantage of such baths is that they heat uniformly. This is particularly important in working slender or irregularly shaped tools. Without the temperature-regulating solution, the sharp end of tools such as punches sometimes becomes

brittle before the body is properly tempered; with it a uniform structure is obtained throughout.

Although most oxide colors disappear when carbon steel is allowed to cool, blue forms a permanent color coat on the metal. Occasionally this treatment will be found handy around the shop as, for example, when blued screws are needed. It is almost as easy to blue them as to buy the com-



Disk-Cutting Tool Project Illustrates Method of Heat-Treating Carbon Steel

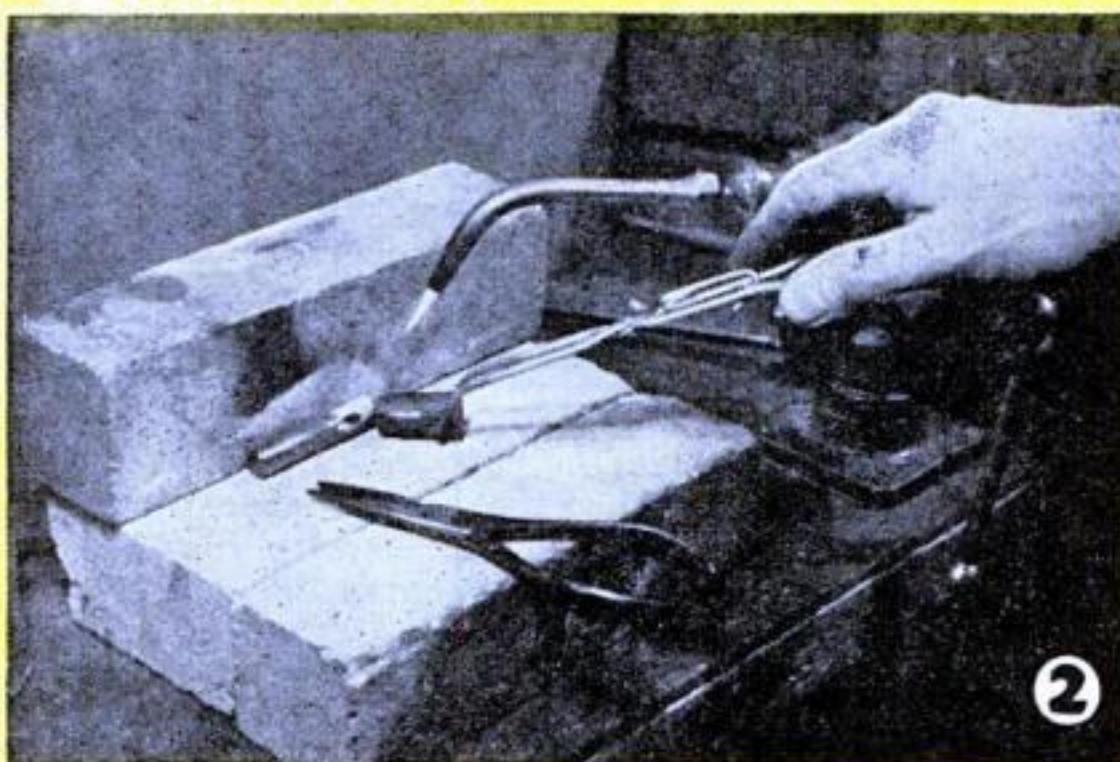
POCKET tools, such as those illustrated above and laid out in the diagram at the lower right, are useful in most shops. The tool for cutting disks of cardboard, fiber, or soft metals is hardened tool steel; the key-ring scribe punches can be machined from cold-rolled steel and casehardened by the steps shown on page 174.

Before steel can be hardened, it must be heated above its critical temperature. Fig. 2 shows a torch being applied to the steel in an improvised brick furnace. There are three ways of determining when the proper temperature has been reached. If a pyrometer is used, heat 70-point carbon steel to 1,450 deg. F; 80-point carbon reaches its critical temperature at 1,440 deg.; steel with more than 80 points carbon needs 1,440 to 1,425 deg. Manufacturers' recommendations should be followed when available.

The second method for determining the critical point is to heat the steel until its color turns a luminous cherry red.

A pocket magnet can be used for the third test. As long as temperature is below the critical point, steel responds to a magnet; above this point there is no attraction.

Usually steel is heated to a few degrees above the critical point to allow for some cooling as it is being moved to the quenching bath. Figure 3 shows the

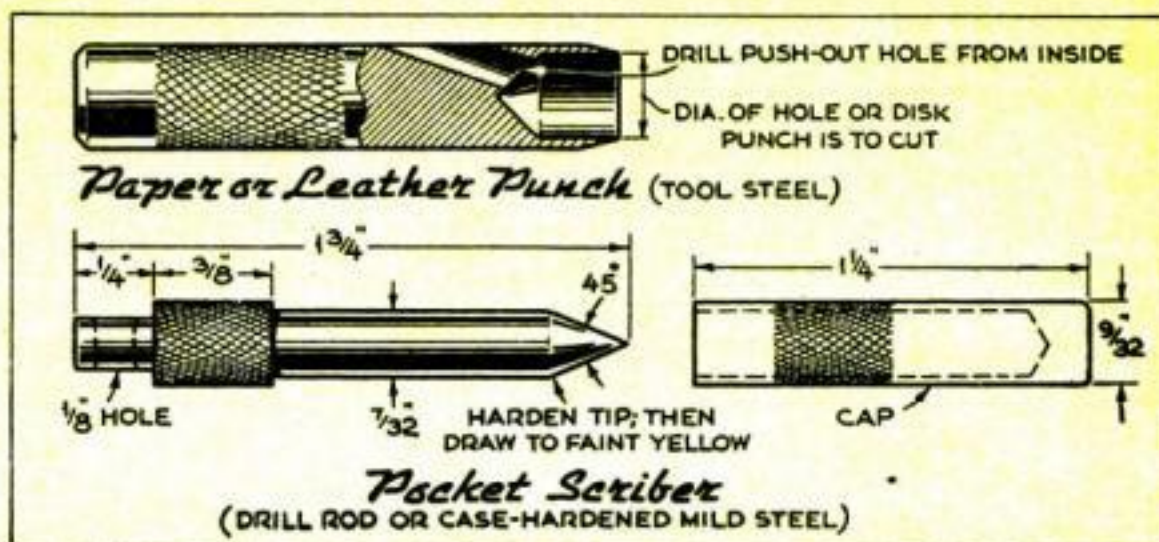
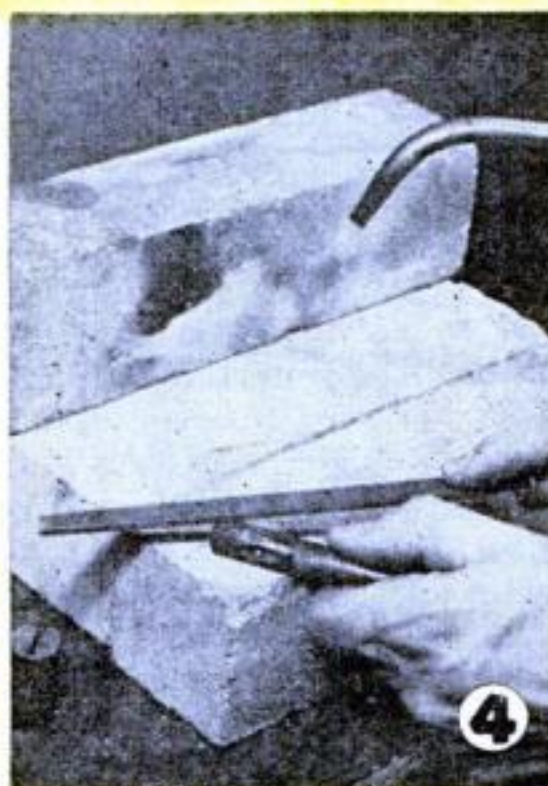


rod being plunged into the liquid to harden the steel.

Is it hard? The file test (Fig. 4) gives the answer. If the teeth of the file refuse to bite into the metal, it has responded properly to hardening treatment.

Before tempering, polish an area of the hardened steel with abrasive cloth (Fig. 5) so that the tempering colors will show. Apply a torch evenly over the surface of the steel, and the instant the proper tempering color appears—or even a moment or two before—remove the torch. The steel may be allowed to cool in the air or it may be quenched in oil. The former method is preferred by many shop men on the theory that it produces fewer stresses in the metal.

In tempering, special allowances must be made for any unequal thickness of the tool.



mercially blued product. An electric furnace is probably the neatest heating device, but the careful application of torch or gas flames will also do the job. Aside from producing an attractive finish, a blued surface is less likely to rust than one that is simply left unfinished or polished.

While regular quenching oils can be purchased, a satisfactory substitute can be made by mixing linseed oil with about half

its volume of automobile engine oil. The latter can be used alone, but has a tendency to flame and burn which makes it somewhat dangerous for indoor use.

The best way to determine whether a particular piece of steel will harden sufficiently for the purpose you have in mind is to saw off a small amount and put it through the hardening process. Then test it with a file. If the file won't bite into the metal, it is



CASEHARDENING of tools is especially useful when it is necessary to machine the metal with extreme accuracy. Fig. 6 shows the scriber-punch nearly ready for the pack-hardening operations.

An old can is used here as a container for the steel parts which are buried together with a carburizing compound. Fig. 7 shows a commercial compound, but you might want to try charred leather or bones such as the ancient armorers used. Wood charcoal

or charred sugar or horn can also be used.

Place the packed tools in a furnace (Fig. 8) and heat them, together with the carburizing material, to about 1,700 deg. F., for approximately 3½ hours. Thickness of the hardened case depends upon the temperature and the length of time the work is heated. After the steel has baked, sift it out of the compound and let it cool. Reheat to about 1,450 deg. F. and quench in water. Temper to a dark straw color.

probably hardened enough for most purposes.

Alloy steels should be hardened and tempered in accordance with instructions furnished by the makers. The average shop owner will be interested in using such steels rather than heat-treating or otherwise processing them. Of particular interest are high-speed steels used for lathe bits, drills, reamers, and so on; the life and service of such metals depend largely upon what the mechanic does to them.

High-speed alloys are those containing such elements as tungsten, chromium, and vanadium, which impart several valuable properties, including the ability to retain a cutting edge at temperatures that would destroy the hardness of ordinary carbon steels.

Even though a high-speed steel tool may hold its edge when red hot, it should be ground carefully so as to avoid heating it beyond the point where you can hold it in your fingers. During the grinding it should never be cooled by being plunged into water. A water-lubricated wheel is helpful; the old-fashioned grindstone, used wet, will ruin fewer high-speed tools than a modern grinder used the way most mechanics do. After grinding, use a hand hone to produce a keen edge, and you will get noticeably longer life between grindings. High-speed steel does not hold as keen an edge as does high-carbon steel, and is therefore not as good for working wood or doing other jobs where keenness is the prime requisite.

Stainless steel is an alloy made up chiefly of iron, chromium, carbon, and sometimes nickel. There are various kinds of stainless steel with differing properties. Some will and some won't harden under heat treat-

ment; most of them can be hardened by cold working, but some types respond to this treatment more readily than others. In general, manufacturers' directions should be followed whenever possible in hardening or annealing stainless steel.

Chromium is the element that gives stainless steel its ability to resist corrosion. To insure the highest degree of corrosion resistance, the surface of the metal should be highly polished.

Proper and exact identification of steel is almost impossible outside the laboratory, but the rough-and-ready methods of the machine shop can afford quick and reasonably accurate answers to many questions. One of the handiest methods is the spark test, in which a piece of the steel in question is held against the grinding wheel and the color, volume, and shape of the resulting sparks is noted. In general, high-carbon tool steel produces a generous shower of many-branched white sparks. Low-carbon or mild steel produces light yellow sparks but not in as great abundance and not as branched. High-speed steels produce relatively few sparks; such as they are, they are usually deep yellow with a tendency toward red, and they show few if any branches. By comparing the sparking ability of known samples, you can easily work out your own system. The table at the bottom of page 175 illustrates some of the more recognizable varieties of sparks.

A small pocket magnet is handy for distinguishing high-speed steel from alloys composed of such materials as tungsten carbide. The magnet will attract the former but not the latter.

CARBON-STEEL OXIDE COLORS FOR TEMPERING

COLOR	Deg. Fahr.	
Pale blue	—650	{ chisels, springs, percussion tools: articles to be given blued finish.
Bright blue	—600	
Dark blue	—550	{ cold chisels and other percussion tools, gimlets, wood chisels, wood-planer knives, and molding cutters to be filed, wood saws, bits and augers, springs.
Purple	—540	
Bronze purple	—530	
Bronze (brown)	—500	{ stamps, punches, engraving tools, twist drills.
Deep straw (golden yellow)	—475	{ lathe, planer, and shaper bits; gauges, hammers, wood chisels, taps and dies, rock drills, punches and dies, reamers, planer knives and molding cutters to be ground, gouges, plane irons.
Straw (yellow)	—450	
Faint straw	—400	{ tool bits and scrapers for brass, hammer faces, planer tools for steel and iron, milling cutters.

QUALITY in tools depends equally upon the materials that are used and the skill with which they are made. Especially in the tempering process is craftsmanship important, for in heating and quenching hardened metal in order to make it less brittle, you also soften the steel. It is therefore necessary to strike just the right balance for the use you have in mind. As steel is heated, a thin oxidation

film forms on its surface and changes color as the temperature changes. Since color variation is very constant, it can be used as a guide when heating metal. Very few standard tables agree as to exact color-temperature ranges, and the one given here represents an average of some of the more common ones. Before using color in a critical operation, try it out on tools which allow some leeway.

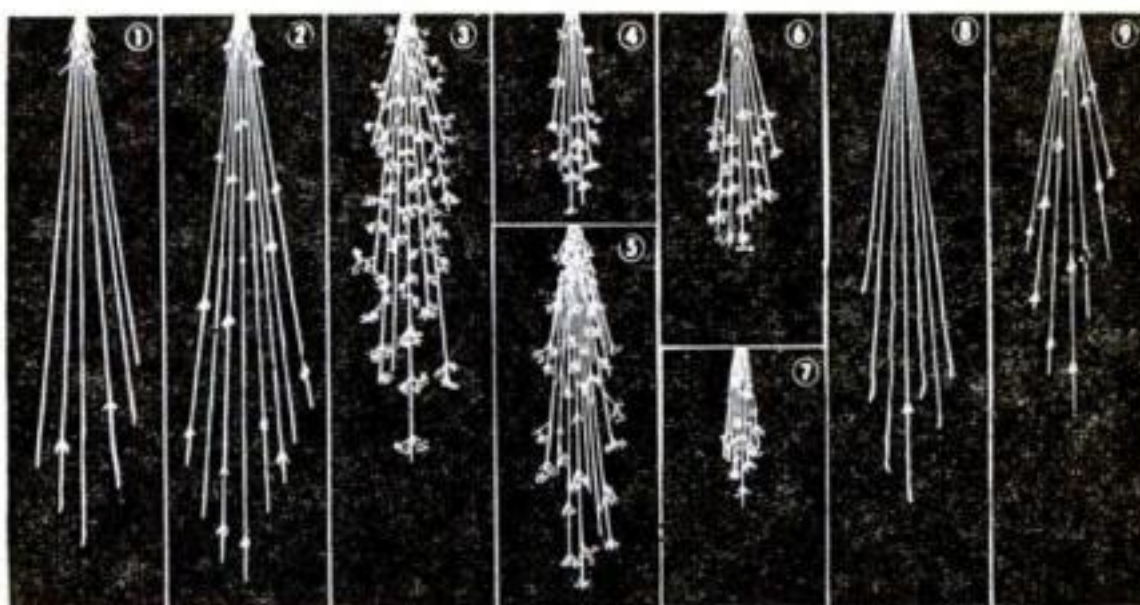
Stainless steel, for all its virtues, is usually a sore thumb when it comes to shop testing. It is hard to identify without making a chemical test; some types are magnetic, some are not; grinding wheel patterns vary, too.

Part of this difficulty comes from the fact that the term "stainless" is rather loosely

applied. Many of the so called stainless or rustless steels can be attacked by corrosive agents. Truly stainless steels can usually be distinguished by applying a drop of vinegar to a polished surface. Allow the vinegar to dry and rinse the metal with hot water. If no stain is left, the steel can be considered reasonably stainless.

Grinding Sparks Furnish Key to Classification of Metals

SPARK testing offers one of the most practicable shop methods for distinguishing and classifying metals. Irons, steels, and many nonferrous metals give forth distinctive sparks when held against a grinding wheel. By studying them, it is often possible to identify an unknown sample or compare the properties of different pieces.

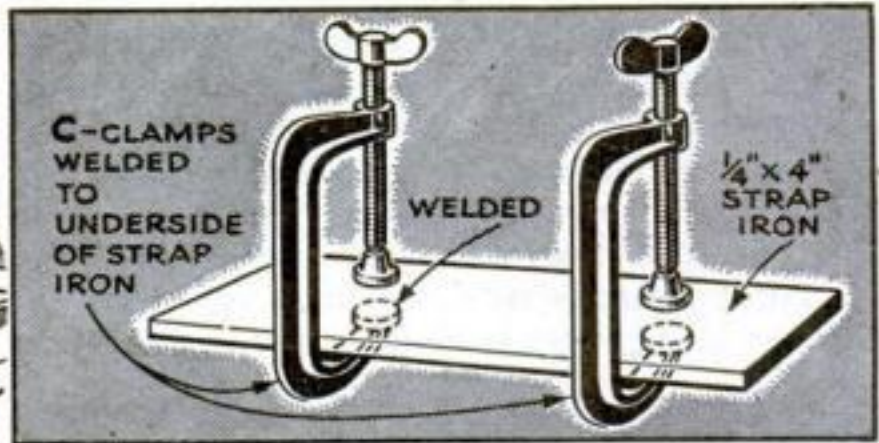


Metal	Volume of Stream	Color Close to Wheel	Color Near End of Stream	Quantity of Spurs	Nature of Spurs
1. Wrought iron	Large	Straw	White	Very few	Forked
2. Machine steel	Large	White	White	Few	Forked
3. Carbon-tool steel	Moderately large	White	White	Very many	Fine, repeating
4. Gray cast iron	Small	Red	Straw	Many	Fine, repeating
5. Manganese steel	Moderately large	White	White	Many	Fine, repeating
6. Annealed mall. iron	Moderate	Red	Straw	Many	Fine, repeating
7. White cast iron	Very small	Red	Straw	Few	Fine, repeating
8. High-speed steel	Small	Red	Straw	Extremely few	Forked
9. Stainless steel	Moderate	Straw	White	Moderate	Forked

Courtesy H. W. Wagner, Norton Company Research Engineer

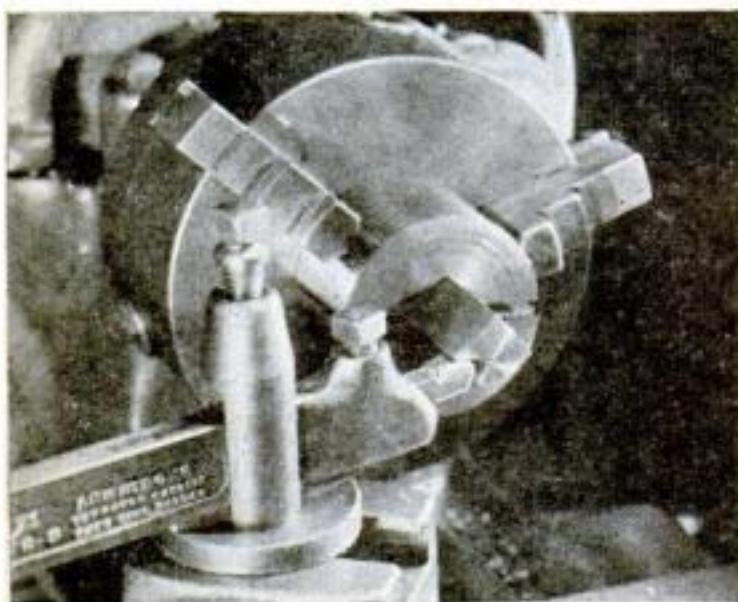
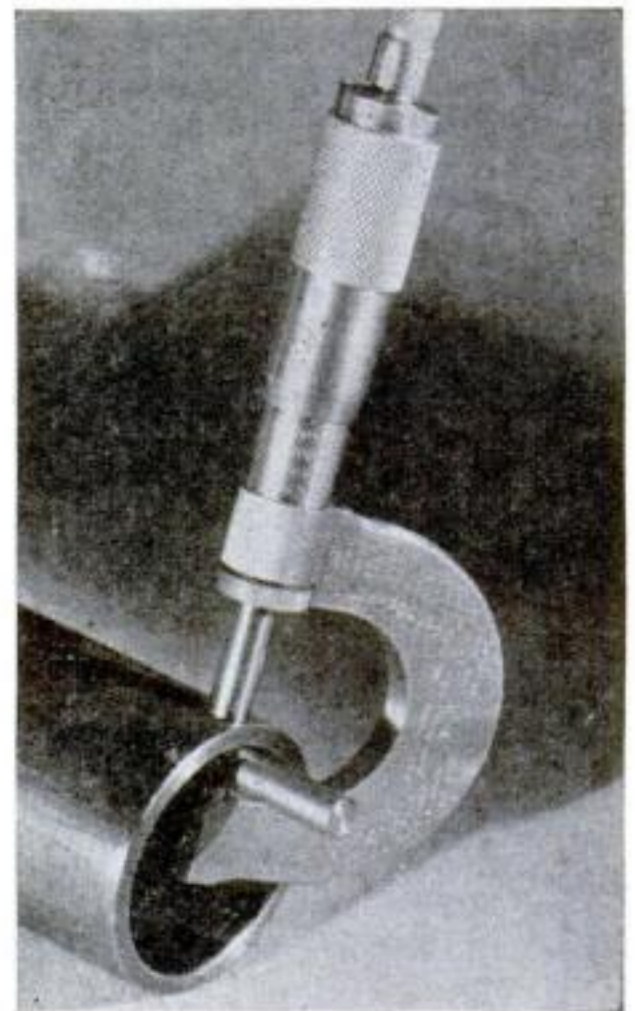


WHEN BUTT JOINTS are being welded or brazed, this tool will hold the two pieces of metal firmly together until they have been joined. It was made by welding a piece of strap iron to the immovable jaws of two C-clamps. If you make two, one can be clamped across each end.—JOHN KRILL.



IF SHARPENED to three points with a center and two side cutters, a standard twist drill makes a perfect tool for drilling holes through light metal. Used with a hand brace, a 1" drill will cut through 22-gauge metal, making a perfectly round 1" hole. If several such drills of various sizes are sharpened, you should find them a useful addition to your tools.—CHRISTIAN LEONARD.

EXACT MEASUREMENTS of the wall thickness and inside diameter of tubing can be obtained with an ordinary micrometer if a piece of 1/4" drill rod is used as shown here. From the micrometer reading, deduct the 1/4" rod diameter, and you will have the wall thickness. Subtract double this figure from the outside diameter for the inside diameter.



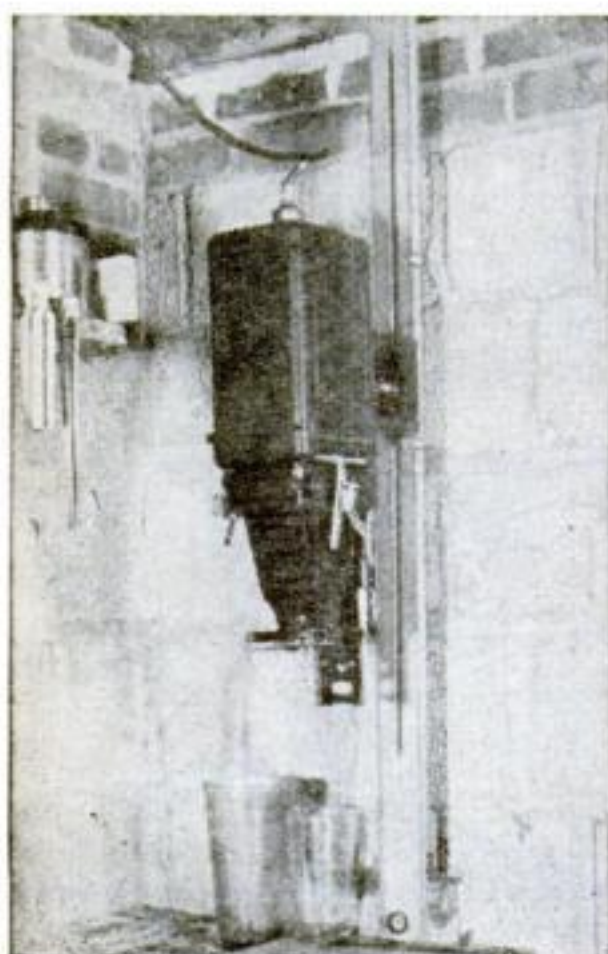
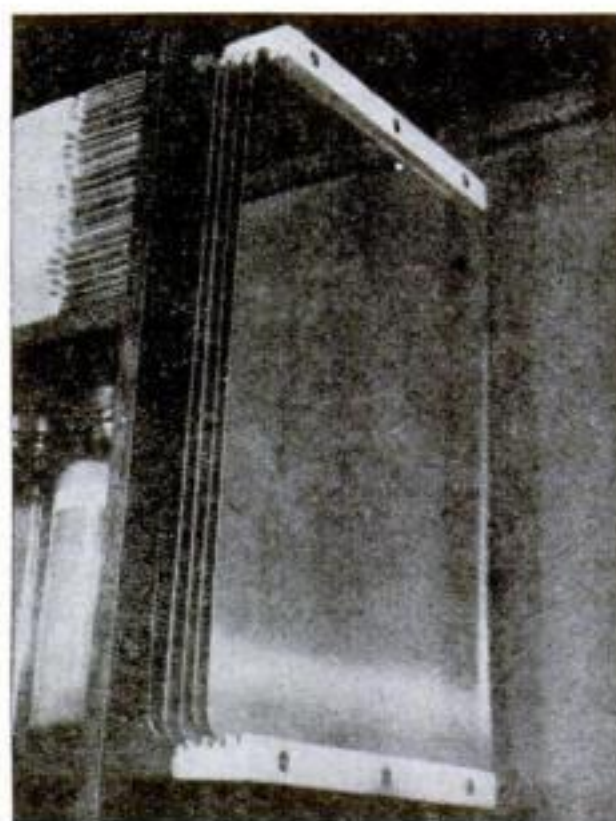
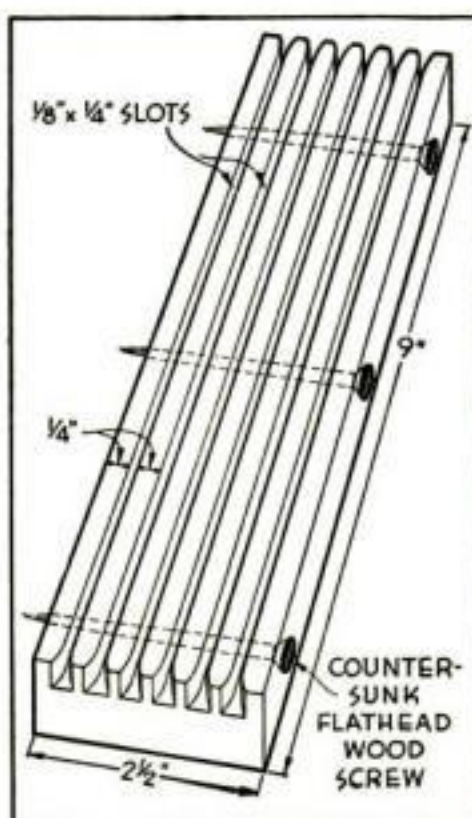
IN TURNING SQUARE STOCK you need not spend a lot of time adjusting each new piece if you fit a three-jaw chuck with an adapter such as that shown at left, for all square pieces will center automatically. This affords an enormous timesaving over the use of an independent four-jaw chuck on repeat work, and the adapter compensates for slight differences in stock sizes.

Use cold-rolled steel for the adapter, turning it to a diameter of about 2" or whatever will suit the minimum size of the square stock you expect to use. After sawing the piece in half, cut an accurate V-notch of 90 deg. in each half on a milling machine or a shaper.—C. W. WOODSON.

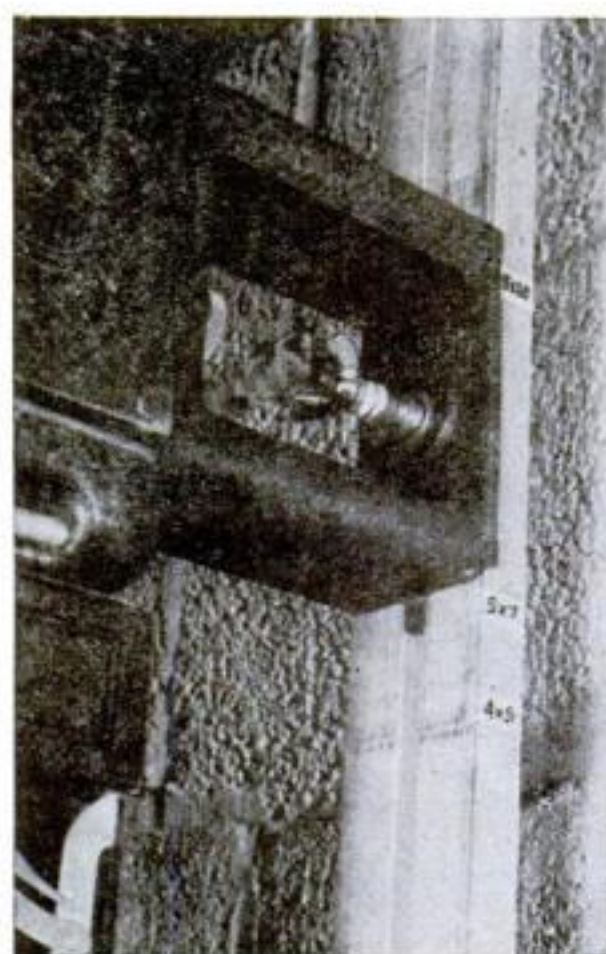


BY ATTACHING SHELVES to an old dresser you will have a spot for compounding photographic developers, hypo, and other solutions at a comfortable working level with a minimum of lost motion. You can use the dresser top itself as the base for your scale, and chemicals kept on the shelves are within easy reach. A sheet of window glass under the scale will give you a working surface that can be easily wiped clean of chemical dust. The drawers of the dresser provide storage for photographic equipment.—GEORGE S. FROST.

FERROTYPE TINS stored in this rack are always handy although neatly out of the way. Cut slots about $\frac{1}{8}$ " wide, $\frac{1}{4}$ " deep, and $\frac{1}{4}$ " apart in each of two strips of $\frac{3}{4}$ " stock. The width of the strips can vary according to the number of tins you wish to store. Flare the outer ends of each groove so the tins will go in easily. Drill holes for screws through both of the strips, and attach one, facing up, to the side of a cabinet or other suitable place. Then use several tins as guides to find the proper place for the upper strip, allowing about $\frac{1}{8}$ " more than the length of the tins.—WILL THOMAS.



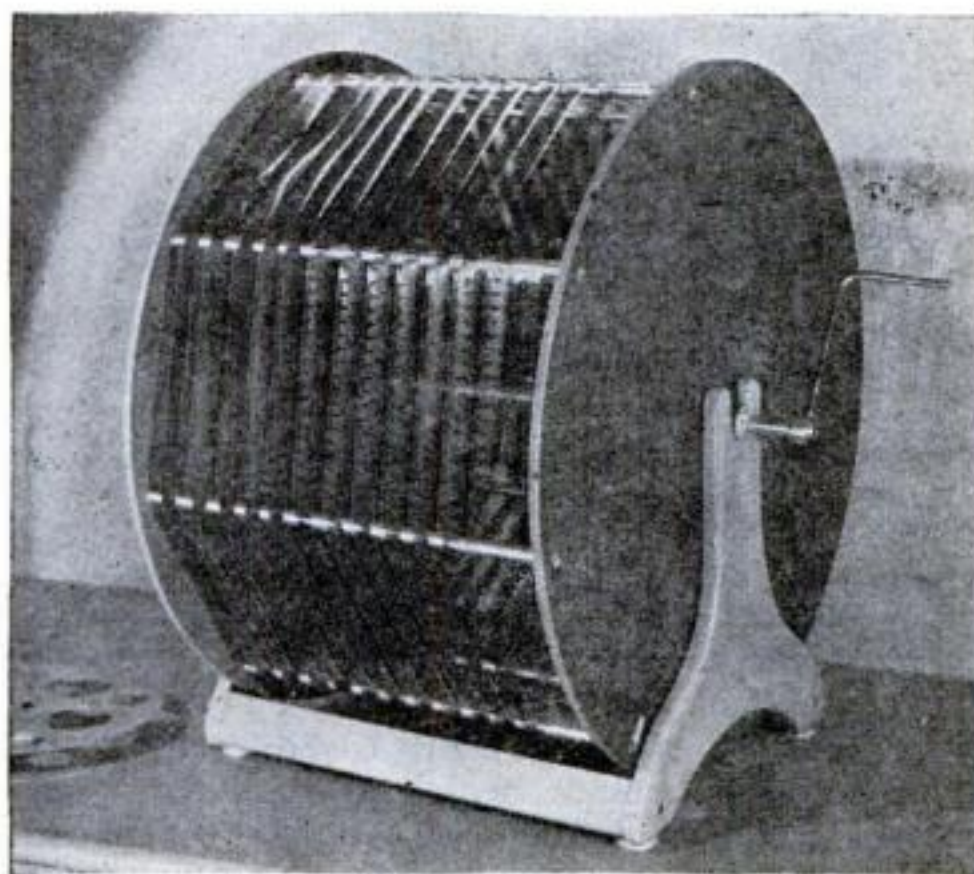
HORIZONTAL enlargers, including those which clamp to the back of a camera, can readily be modified for vertical use. Remove the housing base, leaving only the connecting arm and wing nut and bolt. Make a new slide by cutting a $\frac{3}{8}$ " slot through-out most of the length of a board about 5' long, $2\frac{3}{8}$ " wide, and $\frac{3}{4}$ " thick. If desired, this can be built up from two $\frac{3}{4}$ " by 1" by 5' pieces, held apart at the ends by $\frac{3}{8}$ " spacers. Bolt the slide to the wall, leaving about 3" for clearance.—ARTHUR L. SCHOENI.



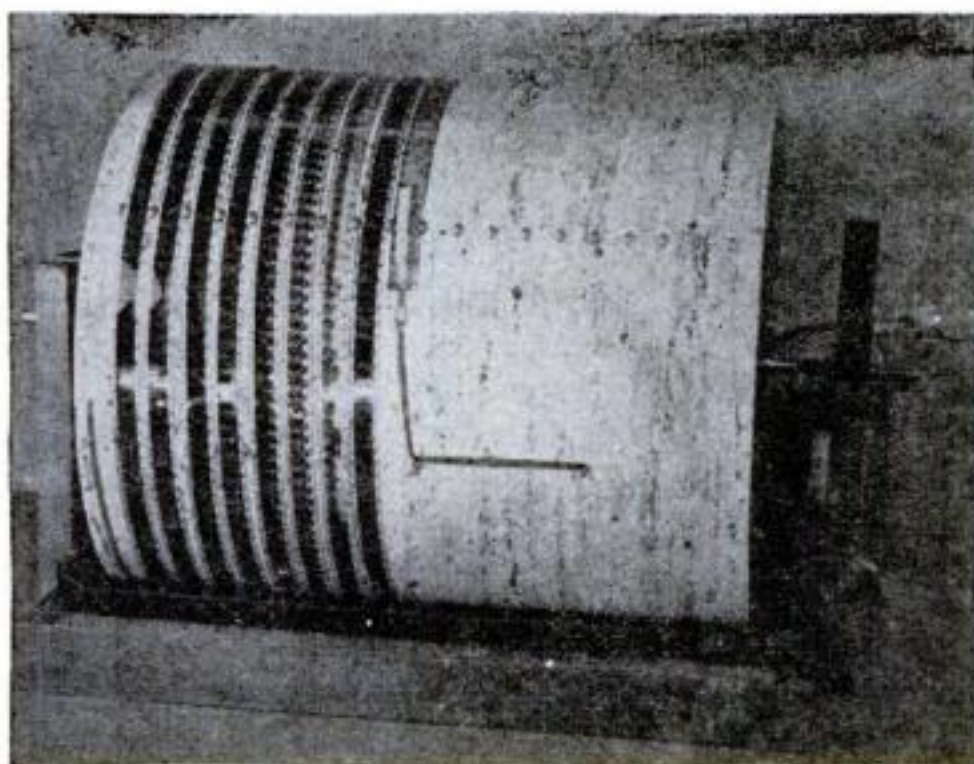


Homemade processing and drying reels eliminate delay. They let you view your home movies within 24 hours.

By ERVIN WALTERS



This is the equipment needed. The drying reel is shown above and the linoleum-covered developing drum below. A tilted tray under the drum carries processing solutions.



WHY postpone that thrill that comes with seeing for the first time what you have taken with your movie camera? There is no need to if you provide yourself with an elementary darkroom, a safe lamp, a set of inexpensive trays, chemicals recommended by the film manufacturer, a developing drum, and a drying reel. Aided by this equipment, you can entertain at home-movie shows with film taken the day before.

Any small room that can be shut off completely from light is suitable for a darkroom. A bathroom or kitchen that meets this requirement is ideal, for running water is a convenience though not a necessity. The safe lamp, developing trays, and chemicals can be purchased at any camera-supply shop. You yourself can make the developing drum and the drying reel.

The former is a linoleum-covered frame with plywood ends; the latter, two plywood disks connected by non-corroding metal tubes or hardwood dowels. With them you will be prepared for developing, reversing, clearing, and fixing, instructions for which may be obtained from film manufacturer's literature.

If you have a 16-mm. camera, you will want your drum and reel about 17" in diameter and 22" in length to take 110' of film. Or you can reduce the diameter to 13" and the length to 15" for 55'. If you use 8-mm. film, a diameter of 11" and a length of 12" will be sufficient for 55'.

Cut two end disks for the developing drum from plywood, pressed composition paneling, or similar material, and cut eight uniform strips for the ribs from $\frac{3}{4}$ " or 1" wood stock. Bore the end disks in the exact center for a shaft; then attach them to the ends of the ribs with countersunk flathead screws. Space the ribs equally and with their outside faces flush with the rim of the end disks so they can be planed to a rounded surface that will

permit smooth laying of the linoleum covering.

A noncorroding-metal pipe or tube $\frac{3}{8}$ " in outside diameter or a hardwood dowel serves for a shaft. Have it 3" or 4" longer than the drum so its ends will project and engage notched uprights on the stand. Make a plate that can be soldered or glued to the shaft and screwed to one end disk. Two spacing collars will keep the shaft from shifting endwise. One should be soldered or glued to the shaft and the other fitted with a setscrew. Turning of the drum will be facilitated by a knob or crank at one end of the shaft. A large radio knob is shown on the developing drum illustrated, while a crank made of a bent rod threaded and screwed into an additional collar is shown on the drying reel.

Light-colored waterproof linoleum is best for the covering. Cut it $\frac{1}{2}$ " wider than the length of the drum and long enough to overlap slightly so it can be trimmed with a sharp knife to a perfect, close-fitting butt joint. Center the joint on one of the ribs, and fasten the linoleum both to the ribs and the edge of the end disks with waterproof linoleum paste, resin glue, or some other good adhesive. Small nails or brads will hold the linoleum at the seams while the adhesive sets. When it has dried, trim the projecting edges flush with the surface of the end disks and smooth them with a file and fine sandpaper. If there are cracks at any joints, fill them with plastic composition wood. Sand this smooth and file down any projecting nail heads.

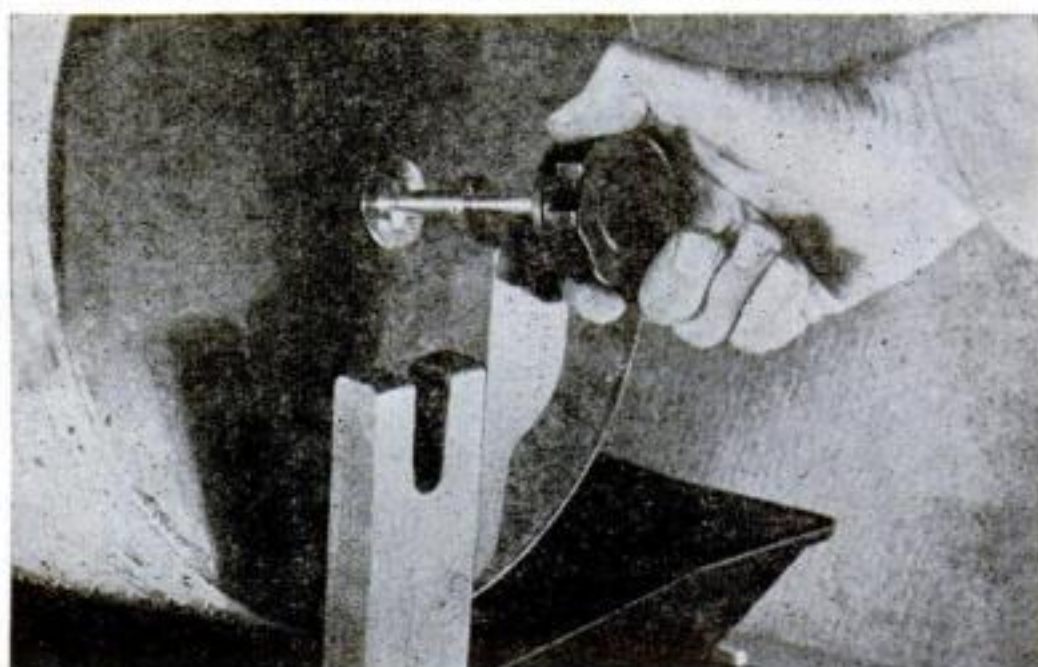
Spacers will be needed to hold the turns of film in place. Those shown are staples bent from $\frac{1}{32}$ " stainless-steel wire and driven into drilled holes in the linoleum on every other rib. They protrude about $\frac{1}{8}$ ". Brass or other noncorroding wire may be used, and any diameter up to $\frac{1}{16}$ " may be bent readily, or wood, plastic, or metal pins will serve. Be sure to round the exposed ends of metal pins to avoid scratching the film. For 16-mm. film, place the spacers on $\frac{3}{4}$ " centers, and for 8-mm. film, on $\frac{7}{16}$ " to $\frac{1}{2}$ " centers.

Fasteners for the ends of the films are two double-claw hooks bent from nonrusting wire. These are shaped so the prongs can be inserted in sprocket holes at the two ends of the film. Screw an L-shaped hook in near the left-hand side of the drum so that a strong rubber band or two or a flexible coil spring looped into one of the double-claw hooks can be held on it. Then, for a similar fastening at the other end of the



Ribs in the developing drum frame are put on flush with the ends, and the outer faces are planed round.

When film is drained, the shaft is lifted from the upright and rested at an angle in the notched block.

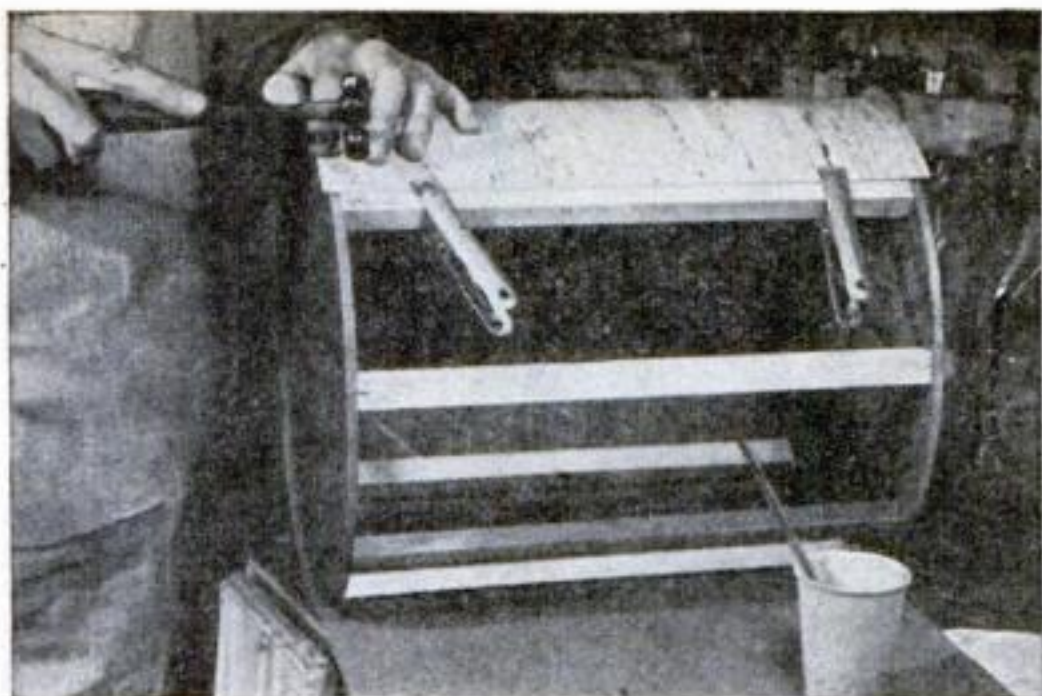


film, screw in several L-shaped hooks at different points near the right-hand side. Put them into ribs not occupied by spacers. They are needed at several points because the length of film processed will not always be the same.

The second double-claw hook is also equipped with a rubber or spring connecting link; and thus, when a strip of film is loaded on the drum with the flexible links pulled to about twice their normal length, slack will be taken up when the film becomes wet and stretches. Be sure to place the end attachment hooks in the drum so they will be between turns of film. And, in processing, remember to wind the film on the drum with the emulsion side out.

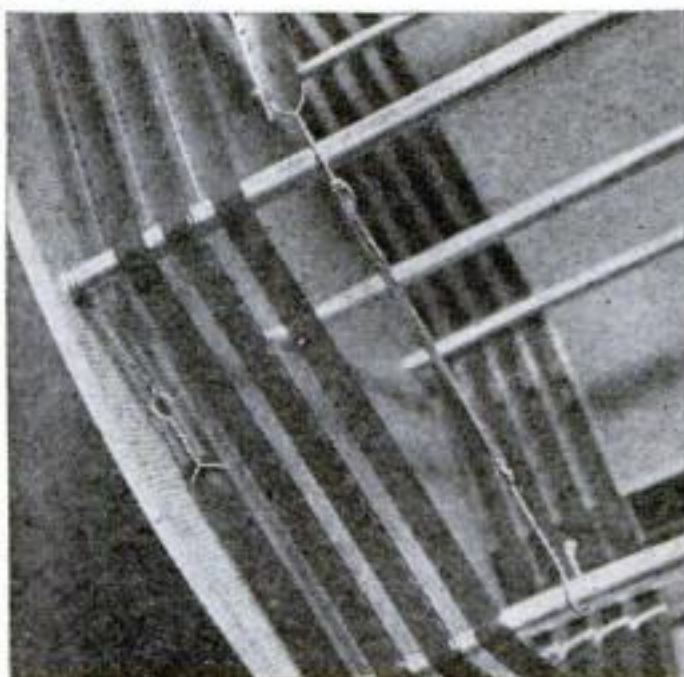
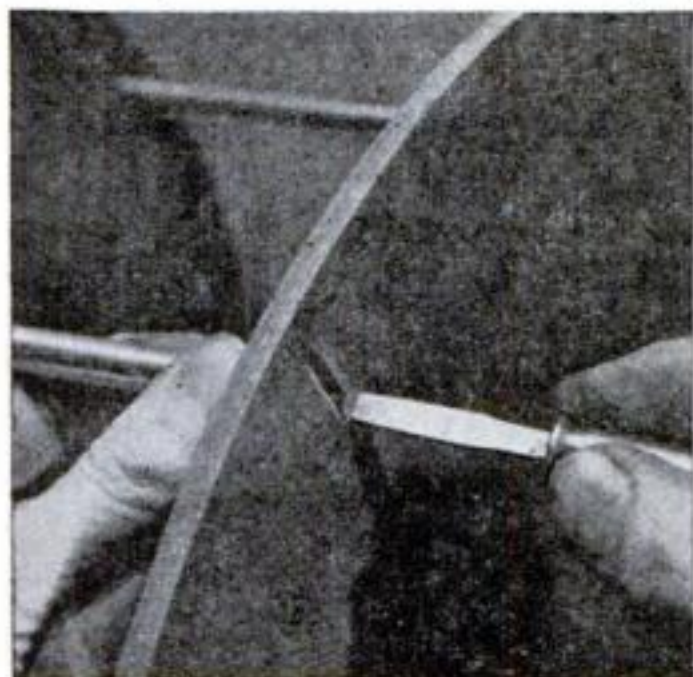
Before using the drum, wash the linoleum with lacquer thinner or a similar solvent to remove grease and wax, and then coat the linoleum, ends, and metal parts with lacquer, synthetic enamel, or another waterproofer that will also resist chemicals.

The drying reel is similar to the drum with the exception that it is not covered



Linoleum is fastened to the drum with waterproof adhesive and held with brads, as at left. Noncorroding metal staples are driven in for spacers so the film won't overlap. They are put in on every other rib.

One rib of the drying reel, shown below, is made adjustable by being held by a bolt in a slot. Double claws, attached to rubber or a spring, engage sprocket holes at the film ends. A handle aids turning.



with linoleum. Scribe the end disks with a circle $\frac{5}{8}$ " to $\frac{3}{4}$ " inside the outside circumference, and then bore the centers for the shaft. Noncorroding metal rods are best for the ribs, but hardwood dowels can also be used. Provide eight ribs, equally spaced as on the drums, and drill holes for them in the scribed circle. If $\frac{1}{8}$ " brass or similar metal tubing is available for ribs, it may be attached by plugging the ends with 6-32 brass nuts turned down to a tight fit. Short flathead 6-32 bolts inserted through holes in the end disks will engage the nuts.

Double-claw fasteners similar to those used on the developing drum hold the film on the drying reel. Connect them with rubber bands or light springs to single hooks that can be slipped over any convenient ribs.

Since wet film stretches and drying film shrinks proportionately, the elastic mountings will take care of most of the play. You should, however, make one rib adjustable by fitting its ends in 1" slots instead of holes, as indicated in one of the photos above. Then, as the film dries and shrinks,

the bolts engaging the ends of this rib can be loosened and the rib moved in slightly. Spacers are not as necessary on the drying reel as they are on the drum, but if desired, metal, plastic, or wood pins may be inserted in holes drilled in the ribs.

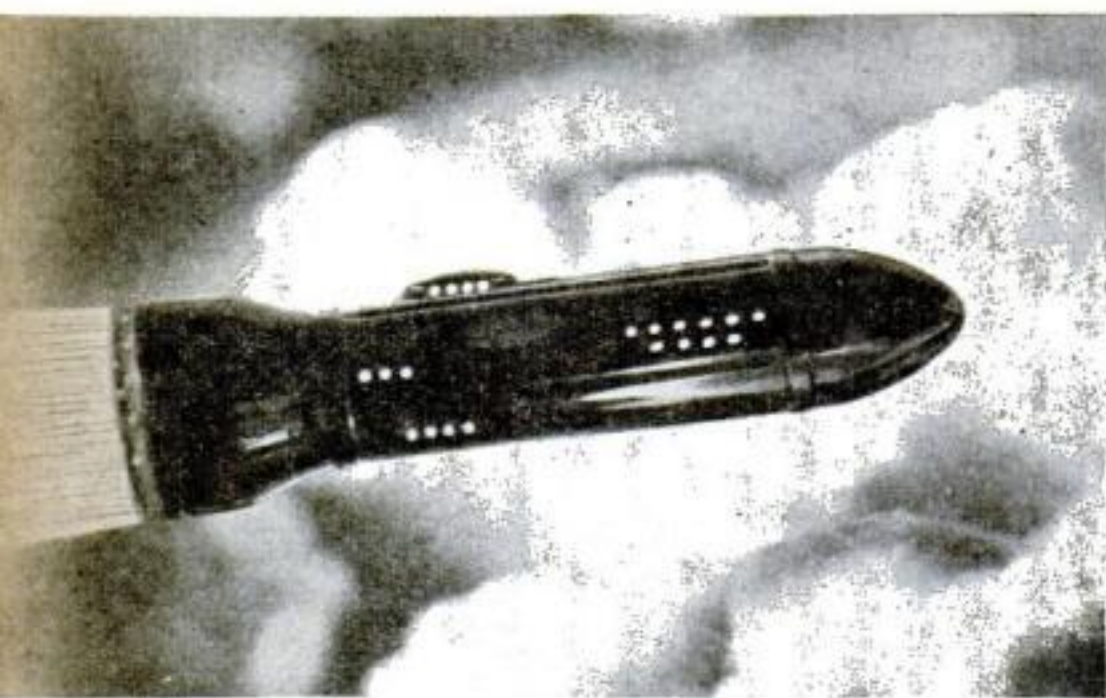
Stands for both the drum and drying reel consist principally of two uprights notched at the top to take the shaft ends and attached to a suitable base. As indicated in the lower photo on the facing page, a notched block is attached to one of the uprights so the film can be drained between processing steps simply by lifting that end of the shaft and inserting it in the notched block.

The base of the developing-drum stand is a rectangle slightly longer than the trays used but not as wide. An inserted tray will thus be held on a tilt. Position the uprights slightly off-center so the tilt of the tray will be forward and the bottom of the drum will be immersed at the deepest point. Turn the drum when using it so the film will be carried toward the shallower side.

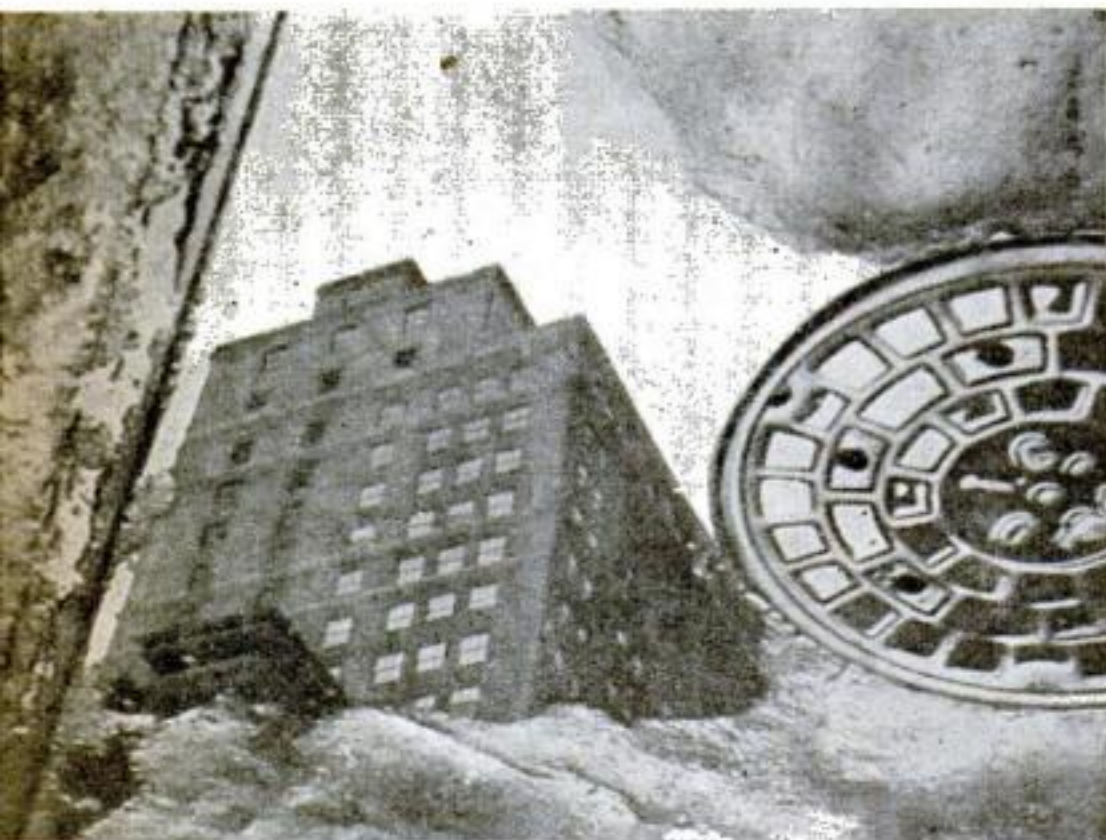
CAN YOU BEAT THESE PICTURES?

We will pay \$5 for any photo used on this page. Write your name and address on each print. Enclose a stamped, self-addressed envelope and the negative, if it is available, and send your contribution to the Curious Photos Editor.

JUST A CUPFUL OF DOG is what Don Aufderheide, of Indianapolis, calls the photo at the right. The little animal, posing contentedly enough, is undoubtedly a great deal more bark than bite—and it may even be more bark than dog if our eyes don't deceive us.

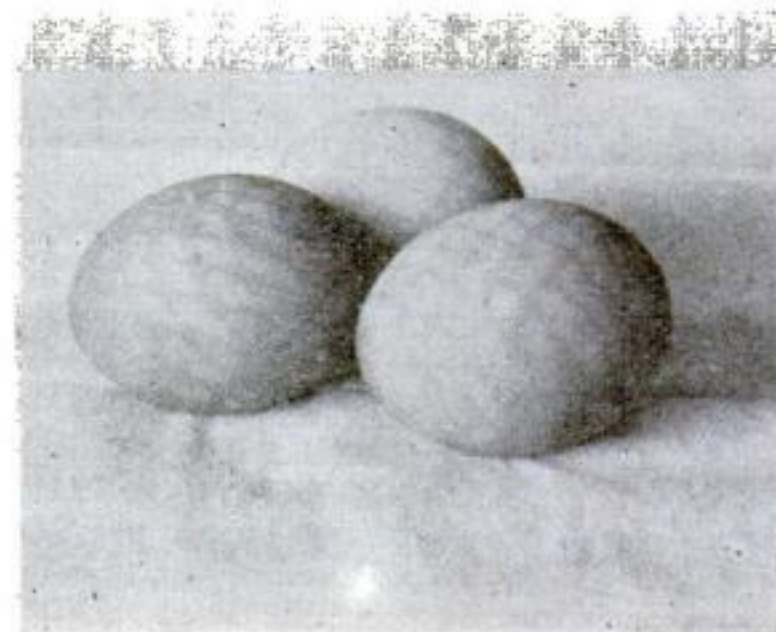


WITH WARTIME ROCKETS in the limelight, the "rocket to the moon" shown at the left is particularly appropriate. Robert Scott, of Saltsburg, Pa., made this fanciful photograph. It is a plastic flashlight on a piece of glass laid over some wads of cotton. A paper negative was made to enable the exhaust jet at the back and the lighted portholes to be added in pencil. It makes just the craft for an interplanetary vacation jaunt.



SKYSCRAPER IN THE STREET. How does this one differ from the buildings you've seen—and perhaps photographed—in puddles following a rain? It's a trick question. This is how such a reflection would look if you stood on your head; we've turned the picture over.

EASTER EGGS? No, just those of a hen with an odd interest in photography. Jennings Hopkins, of Paragould, Ark., explains the picture with the theory that the eggs were photosensitive for a short time after being laid. When the hen had deposited these in the nest, bright sunlight shining through a wire-screened part of the chicken coop did the rest.



BOOM LIGHT GIVES FLEXIBLE PHOTO LIGHTING

ONE of the most valuable pieces of equipment a photographer can make for himself is a boom light on wheels with a long counterbalanced boom. With such a light, illumination can be directed exactly where needed for any particular setup.

The base should weigh between 30 and 50 lb. A junk yard may yield a cast-iron base of proper shape and weight—or at least a wheel or heavy object convertible to such use. You might also improvise a base from a box filled with sand, bricks, or gravel. Mount the base on swivel casters so that the light will roll easily in any direction. If the base is iron, a wooden platform will facilitate attaching the casters.

A good length for the vertical member, which is of 2" by 2" stock, is 40". To determine the length of the boom, measure the

distance from the top of the vertical member to the ceiling and add about 26". Of this length, 16" should be devoted to the counterweight end. Keep the long arm as light as possible. A sturdy metal curtain rod fitted securely into a piece of hardwood makes a good boom. An inch or two of thin-wall pipe forced over the wooden end will keep it from splitting. The clip-on type of photographic lamp, being equipped with a ball and socket joint, is excellent for the light itself.

The boom pivots on a short piece of metal rod passed through it and the vertical member. Center two wooden disks 4" in diameter on the rod and notch each into the facing surfaces of the vertical member and boom. Fasten a doorknob on one end of the metal rod with a setscrew. On the other end thread a nut. When the knob is turned, pressure on the disks locks the boom.

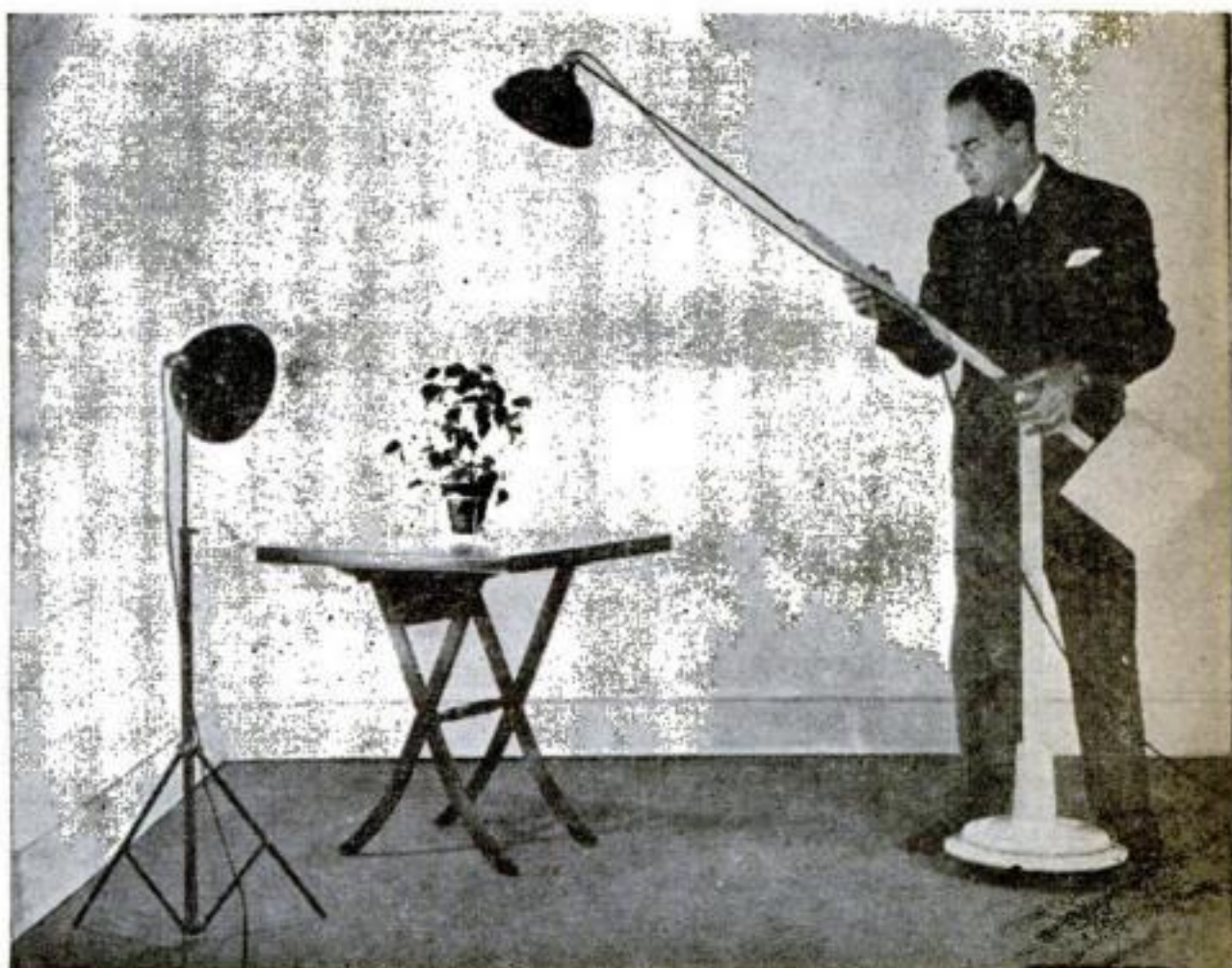
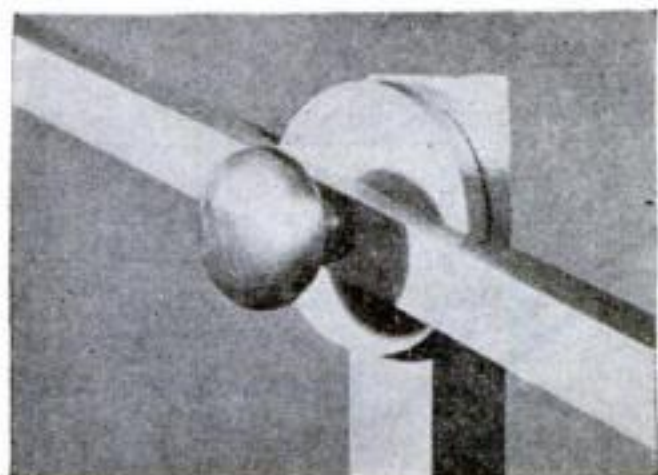
For convenience in using the light, the counterweight should be as flat as possible and just heavy enough to balance the boom. To determine the weight required, suspend a bucket on the counterweight end, after the light is otherwise complete, and pour in weighting material such as sand or gravel until the boom balances. Weigh the bucket and material and divide this figure by the weight of one cubic inch of the weighting material. The result will be the cubic capacity of a wooden box just large enough to hold the amount needed. Make a box of this size, bolt it on, and fill with material.—CHARLES AND BERTRAM BROWNOLD.

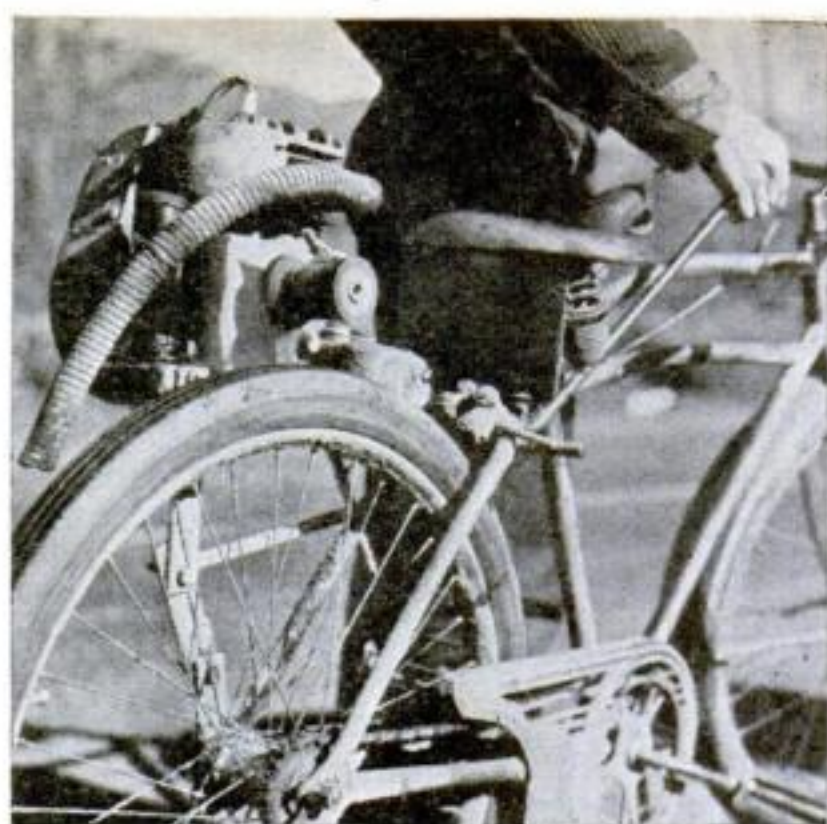
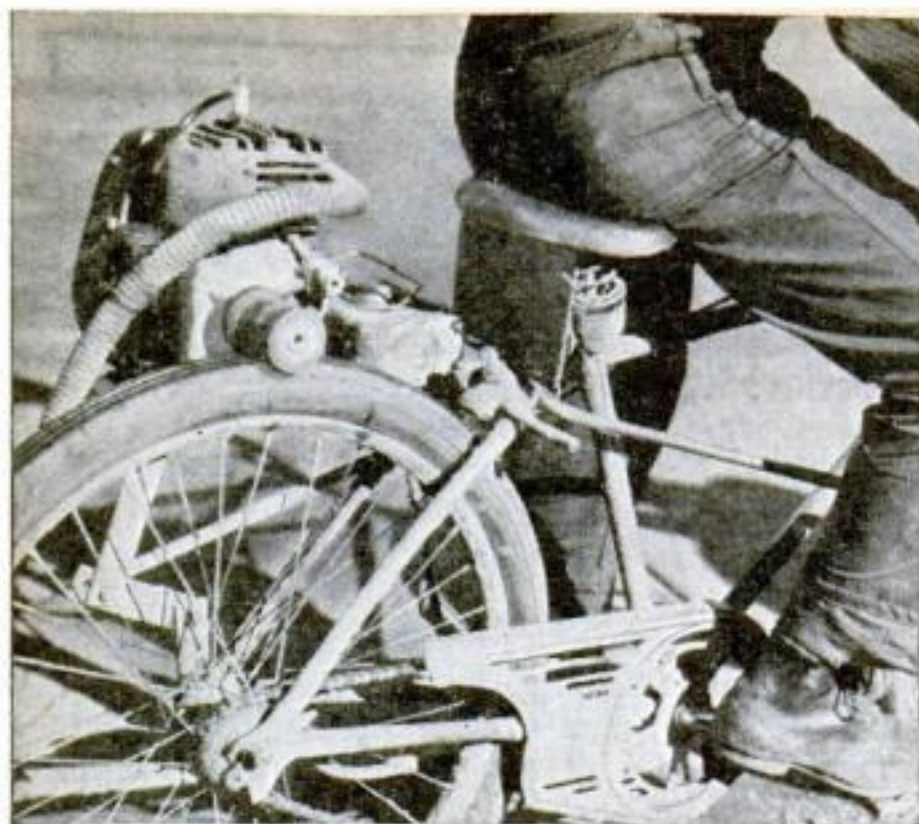


The counterpoise allows the light to be positioned at any level from ceiling to floor.

In use below, the light is wheeled into place on its swivel casters and adjusted to illuminate photo subject on table.

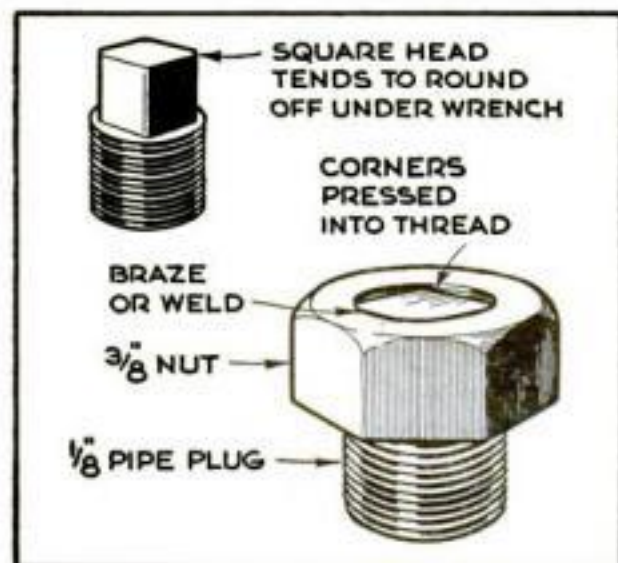
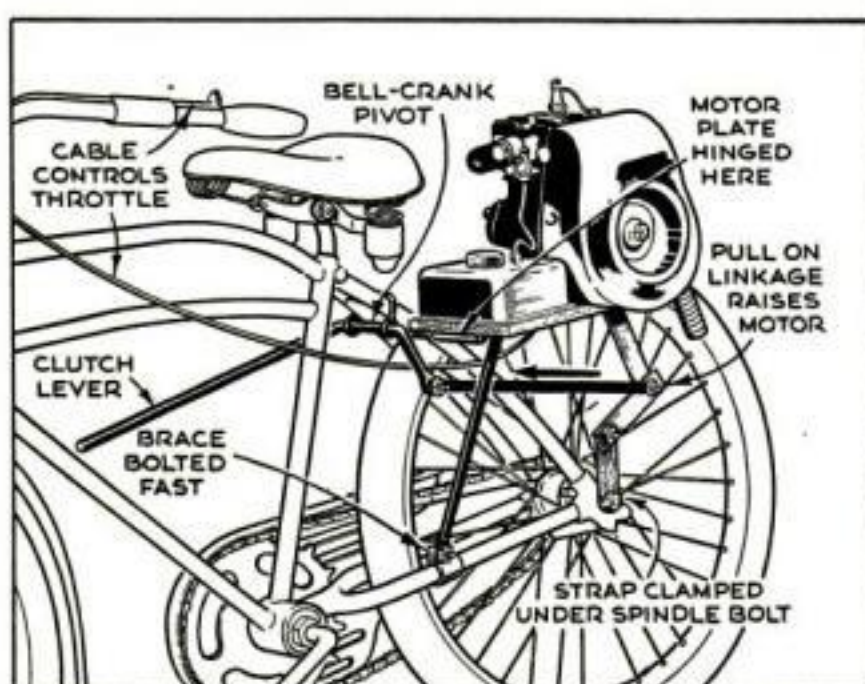
Friction disks, locked in place by a doorknob as handle, hold the boom in any angle that you may select.





Bikes Powered by Old Engines

SMALL $\frac{5}{8}$ -hp. gasoline engines taken from old washing machines drive the bicycles of paper-delivery boys in Grants Pass, Ore. Each motor is mounted on a floating platform over the rear wheel, which it drives by means of a friction spool resting on the tire. Interchangeable spools of two sizes are used—a small one for power in hilly country and a large one for speed on level roads. An old motorcycle control governs engine speed. The boys average about 25 m.p.h. on level stretches and travel more than 100 miles on a gallon of gasoline. A bell-crank lever acts as the clutch.—DALE VINCENT.

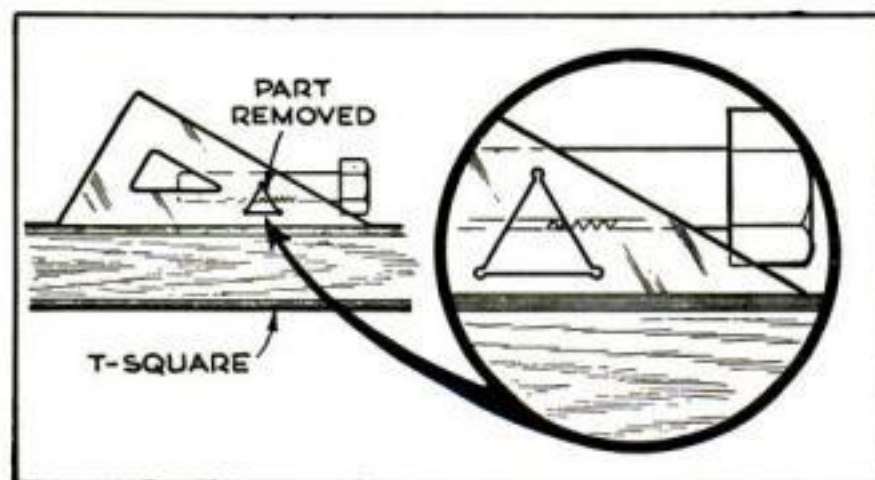


Nut on Pipe Plug Makes Removal Easy

REMOVAL of small pipe plugs becomes a problem if their heads round off, leaving no surface that a wrench will grasp. This difficulty can be prevented by forcing an SAE nut over the head. Squeeze the two together in a vise to do this. If a nut of the right size is selected, the corners of the plug head will be forced across the threads. For instance, a $\frac{3}{8}$ " SAE nut will fit over the head of a $\frac{1}{8}$ " pipe plug and a $\frac{1}{2}$ " nut over a $\frac{1}{4}$ " plug. The hexagon head of the nut forms an ideal surface for a wrench and is less likely to round off. Brazing or welding will hold the nut on the plug.—C. H. HARDY.

Triangle Aids Thread Drawing

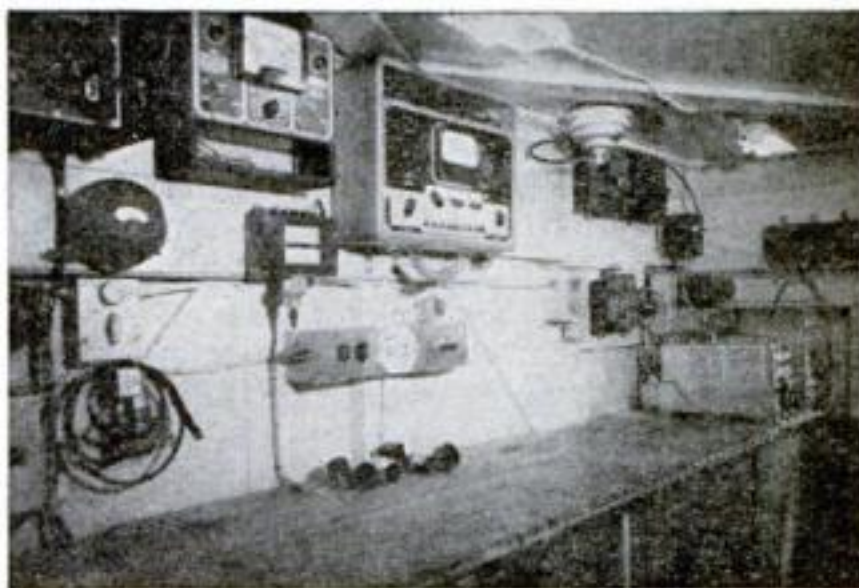
AN EQUILATERAL triangle cut in an ordinary draftsman's triangle will provide a handy guide for drawing thread profiles, making it unnecessary to keep turning the instrument itself. In cutting the opening, make certain that one side is parallel with the edge of the triangle so that when the latter slides along a T-square the thread lines will be at the same angle.—H. D.



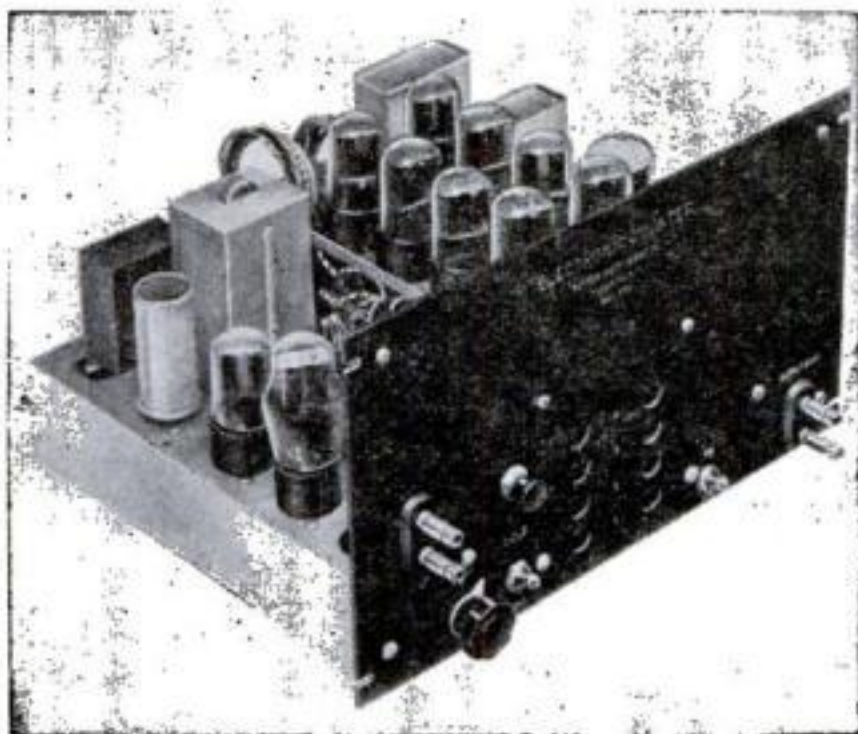
radio ideas

RADIO REPAIRS at advanced bases of one 9th Air Force squadron did not have to wait for standard equipment to be brought up from the rear. T/Sgt. Forrest D. McDaniel, of Wichita, Kan., an assistant communications chief of a Marauder group, built this mobile repair unit that could be carried anywhere by truck. Made of scrap lumber and large packing crates, the shack was fully equipped with regulation aircraft radio instruments for quick tests and repairs.

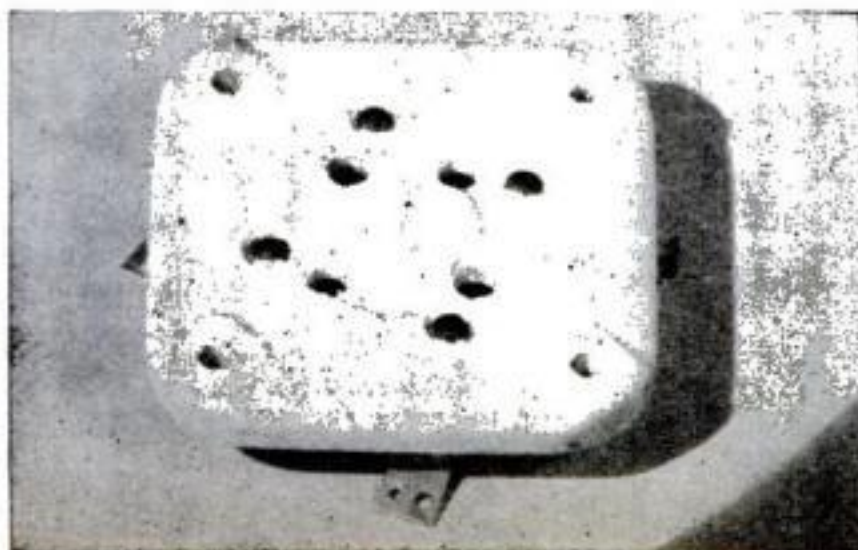
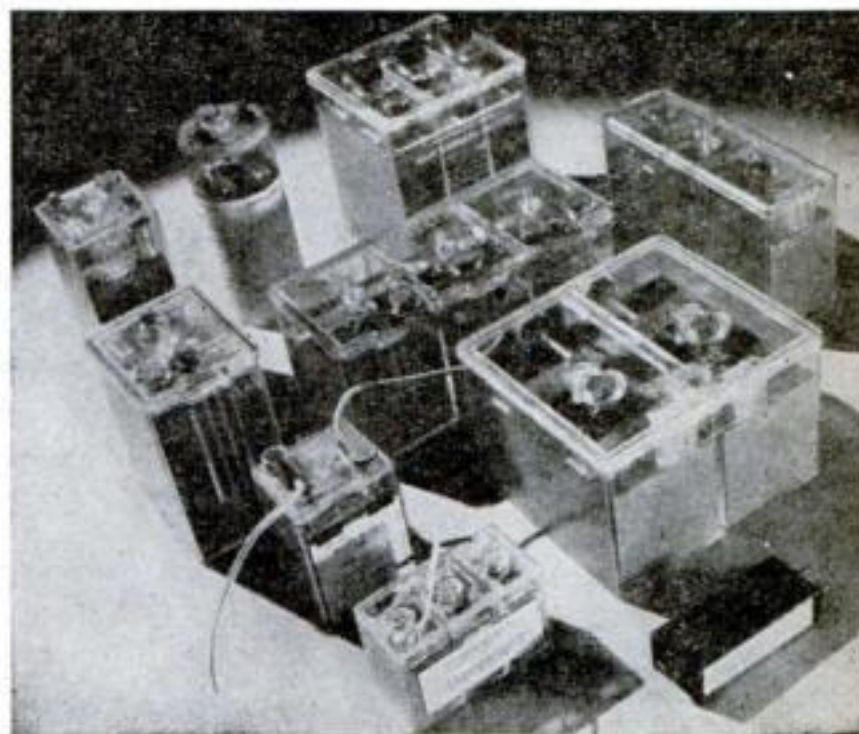
Two gas-engine power plants supplied the electricity required for operation of the shack. The lower picture shows how the test equipment rigged above the bench conserve the limited amount of space available for work or storage. Flattened tin-can sections were used to waterproof the roof, and the joints of the cabin were securely reinforced to withstand the strains of moving.



AN ELECTRONIC COUNTER, capable of being adapted to a variety of counting operations, has been announced by the Potter Instrument Co., of Flushing, New York. The device may be actuated by a mechanical contact, an A.C. pulse, or an electric input as from a photocell. Because it works electronically, the machine is said to withstand high speeds and continuous operation better than most conventional counters.



PLASTIC BATTERY CASES made of polystyrene have been produced by the Willard Storage Battery Co. The trim appearance of these power units is obtained without sacrificing efficiency, for polystyrene is a transparent plastic with high resistance to the action of acids and other chemicals. By permitting the interior of the battery to be seen, it provides an almost automatic check on the liquid level.



TRANSMITTING TUBES must be protected against circuit losses at every contact point, especially when used at high frequencies. To provide this protection, the E. F. Johnson Co., of Waseca, Minn., designed the socket shown at the left to accommodate the new jumbo four-prong tubes. It is molded from a single piece of steatite.

ELECTRONICS WITHOUT

Vacuum Tubes Can't Handle the Infinitely Small Wavelengths of the

By JOHN W. CAMPBELL, JR.

ELECTRONICS is sometimes called the science of vacuum tubes. It isn't.

But when you consider the prodigious feats that have been performed by ingenious arrangements of cathodes, grids, and anodes, it is not to be wondered at that many people look upon vacuum tubes and electronics as practically the same thing, or, at any rate, inseparable.

As a matter of fact, electronic science has now reached a point where it has driven vacuum tubes into a corner. These little metal or glass gadgets are still doing a wonderful job down in the basement of the

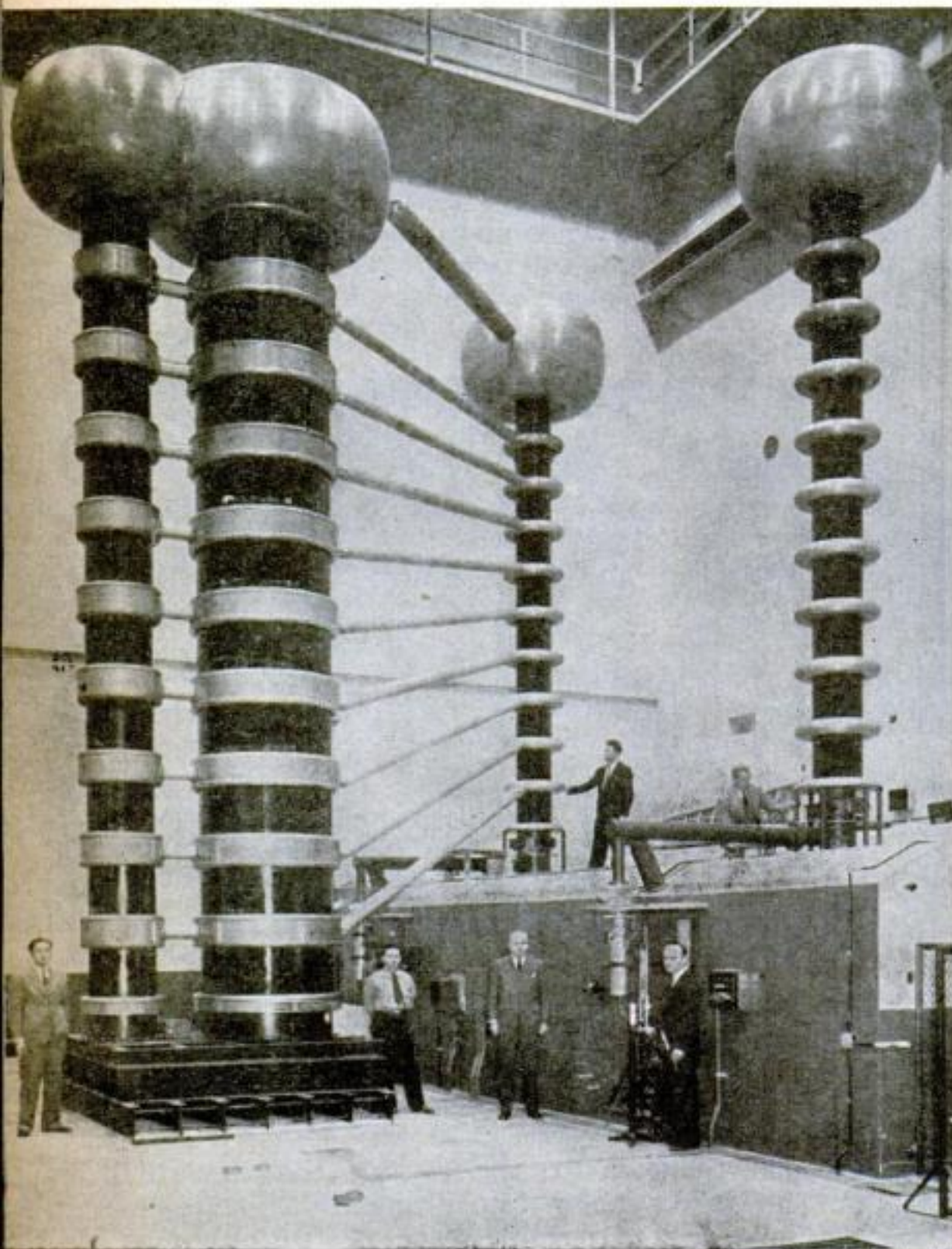
radio spectrum, but when they try to climb out they find that nature has a tendency to push them back.

The scale of wavelength distribution on the opposite page shows the portion of the spectrum that vacuum tubes can cover. It looks pretty big until you notice that the scale is drawn logarithmically—that is, the distance between 10 and 100 looks the same as that between 10 trillion and 100 trillion. If the divisions had progressed by spaces arithmetically equal to those at the bottom, ten full years' printing of this magazine would not have furnished enough paper to draw a single scale!

Waves in different regions of this vast spectrum naturally exhibit different characteristics, and as the characteristics change, so must the devices and materials that are used to study or control them. In the higher frequencies and correspondingly shorter wavelengths, vacuum tubes have run into a seemingly insurmountable obstacle—size.

The highest frequencies that have yet been reached in radio communication employ almost microscopic tubes—tubes so small as to make even the tiny acorn tubes seem gross by comparison. Tubes have to be small because the resonant-circuit frequency depends upon the inductance and capacitance of the circuit (indicated symbolically by the letters L and C respectively). At ordinary frequencies the L and C factors are governed by an external arrangement of wire coils and condenser plates in the tuning circuit. At 1,000 megacycles (1,000 mc.) these values must be extremely low—so low, in fact, that the internal cathode-to-plate capacitance of ordinary tubes and the inductance of the shortest possible leads from grid to cathode exceed the total permissible value of L and C.

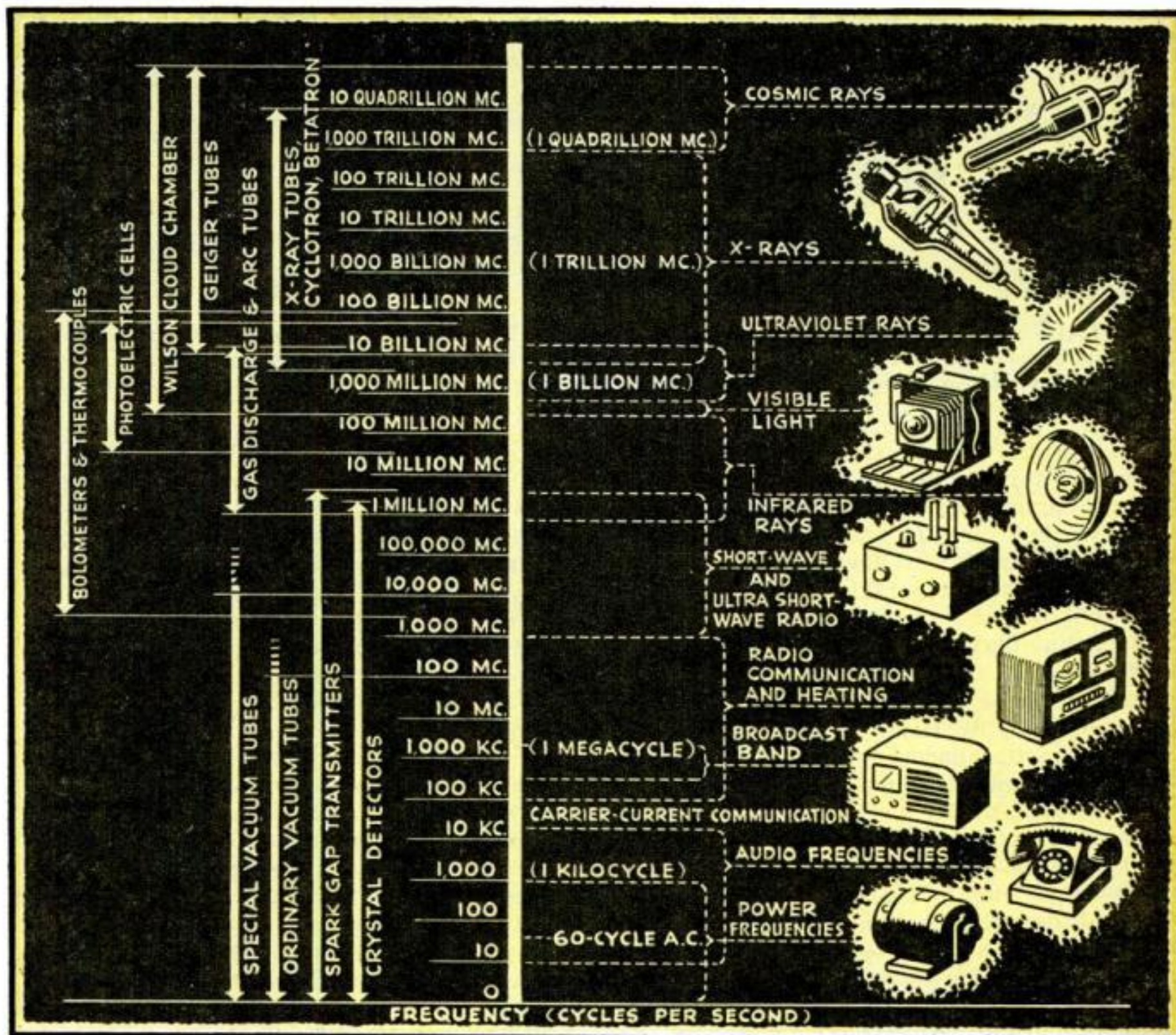
X-RAYS vary in penetrating power according to the force with which electrons are emitted. This machine gives electrons a 1,400,000-volt send-off.



Courtesy General Electric

VACUUM TUBES . . .

Ultrafrequencies, But Atomic Structures Work Anywhere in the Spectrum



To operate at still higher frequencies, say 1,000,000 mc., tube components actually would have to be microscopic!

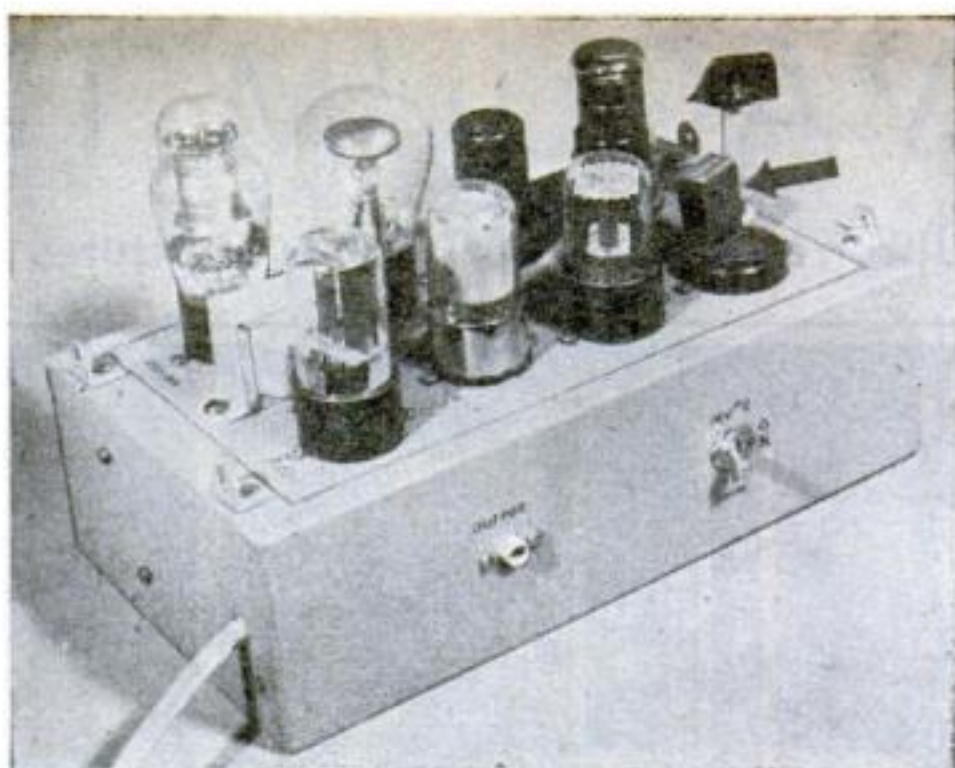
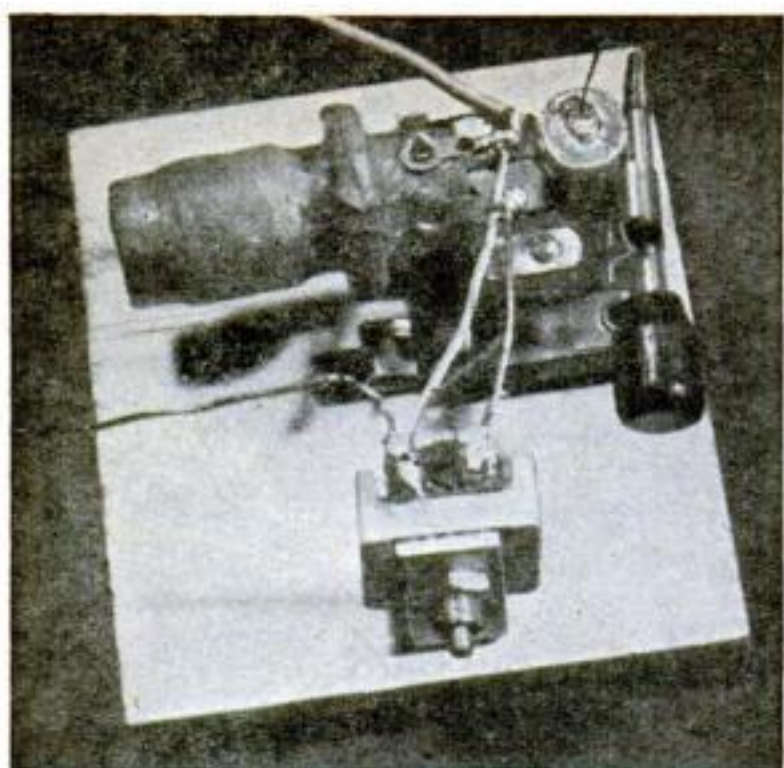
Nor is this the only way in which size hampers vacuum tubes. In a vacuum tube, the flow of electrons takes place from a negative cathode to a positive anode or plate. By our ordinary human conceptions of time, these electrons travel at enormous speeds. Electronically, however, they are not fast enough.

Let us assume that we are dealing with a large vacuum tube. Electrons leap out of the cathode and travel across to the plate in, say, one millionth of a second. What do you do when you want to use frequencies above one megacycle—that is, when the flow must alternate faster than a million

times a second? Obviously you make the distance smaller—much smaller. But even when you get electrons alternating ten or a hundred million times a second, you still haven't scratched the surface of the available frequencies. No matter how hard you try, you just can't make already tiny tubes a thousand times smaller still!

But while size may be a crusher to a vacuum tube, it is no problem at all to an atom. Atoms have no internal capacitances or inductances, and their internal distances are so minute that the question of transit time need hardly be raised. This is almost equally true with respect to spaces between atoms in a molecule.

If only we could get atoms to do our electronic work directly . . . [Turn the page.]



CRYSTALS play a large part in both the sending and receiving ends of radio. Typical of many old-time sets is the galena detector model, left, which can operate entirely without tubes. A piezoelectric quartz crystal in the oblong holder (arrow) controls the carrier frequency of the transmitter shown at right.

As a matter of fact, they have been doing it since before radio was born. Hertz didn't have vacuum tubes and neither did Marconi. They worked directly with atoms, and now we're going back to follow their lead. Back to the neglected stepchildren of electronics: the oscillators and frequency-responsive materials that played such a large part in the early days of radio.

For example, spark-gap transmitters of the type used by Hertz in the experiments that led to the discovery of radio have not been surpassed in frequency range by any vacuum-tube device yet built! One of our upper high-frequency transmitters uses a tricky spark-gap device that consists of particles of metal dust suspended in an oil bath. When the bath is put between the terminals of a high-voltage supply, tiny sparks occur between the minute metal particles, converting each particle into a resonant circuit. Electrons race across the surface of the particle to the point at which the arc takes off, constituting a current. The capacitance between the particles, acting with the inductance effects of the flowing currents, constitutes a circuit tuned to an enormously high frequency.

To use these frequencies in communication, it is necessary to be able to detect the signals generated. This can be done in several ways. Crystal detectors operated in conjunction with local oscillators, such as are used in superheterodyne radios, can knock a very high frequency down into a lower, more manageable frequency range.

Right up along with spark gaps in the class of renovated old-timers is the crystal detector. If you recall the dim days of radio pioneering, you undoubtedly remember the humble chip of galena that was used to de-

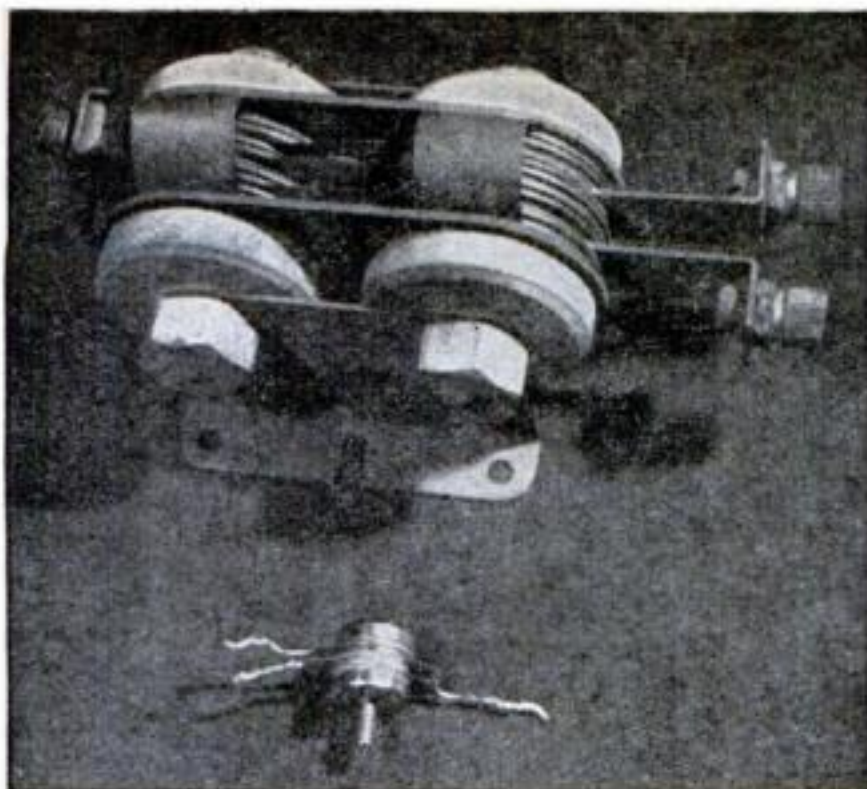
tect and demodulate the broadcast wave. That crystal, too, has never been surpassed or even equaled! Having no cathode-to-plate capacitance, a tightly mounted crystal works well up to 1,000,000 mc.

Crystal detectors, to be sure, do not afford us any amplification and cannot handle strong signals, but in putting atoms to work directly they exemplify an important type of action known as "barrier-layer phenomena."

In effect, a barrier layer is a layer of molecules showing a definite orientation with respect to electron movements. We can detect its formation by the fact that electrons can move through it fairly freely in one direction but not in the other. The resultant action is that of a rectifier.

A piece of copper, coated with copper oxide, assumes this barrier-layer property, and copper oxide rectifiers are widely used. A first cousin to this device is a unit made up of copper, a copper oxide barrier layer, and a film of translucently thin metallic silver. If these components are closely sandwiched together and the unit is exposed to light, a sensitive microammeter will show a considerable current. At present this arrangement is used chiefly in photographers' photoelectric light meters, but it is already in the cards that if electricity generated by light can be *measured*, it can also be *harnessed*! And Old Sol pours down enough light energy to illuminate the earth by night as well as by day!

In addition to the barrier-layer type of crystal, there is another prominent crystalline group distinguished by a property known as the piezoelectric effect. Piezoelectric crystals oscillate mechanically when struck, and the oscillation sets up an electro-

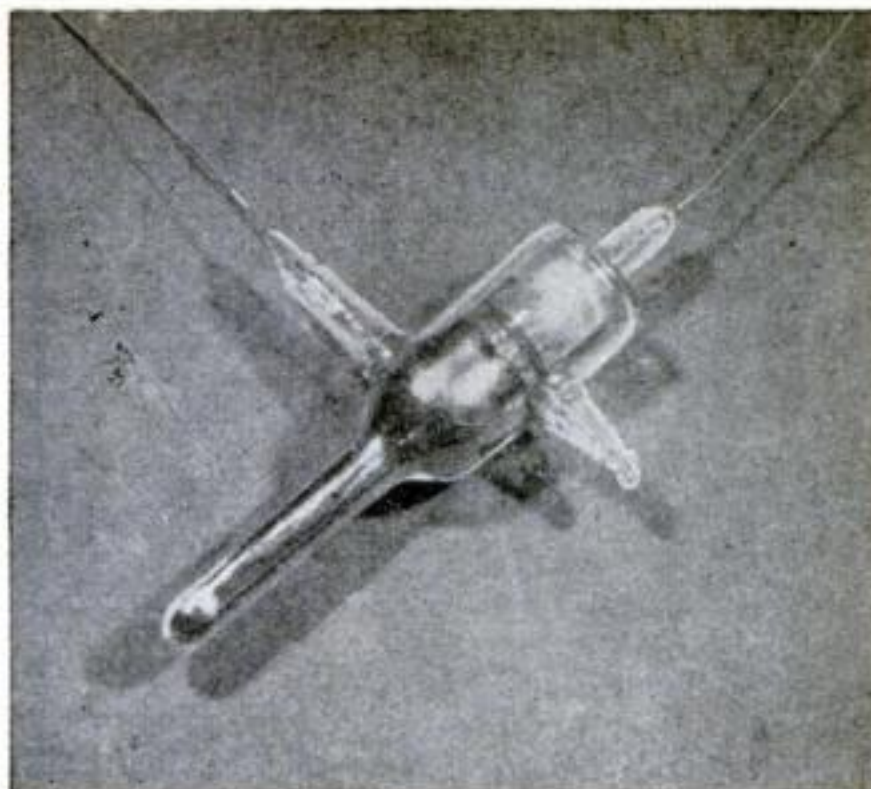


BARRIER-LAYER effects explain the operation of copper oxide rectifiers. The larger unit is used in a battery charger, the smaller in an ammeter.

static field. Conversely an electrostatic field can set up mechanical oscillations in a crystal. Being a very stable oscillator, quartz crystal is widely used to control the frequencies of radio transmitters. Rochelle salts are employed in microphones to convert the mechanical pressure of sound waves into electric potential. Crystal earphones and loudspeakers reverse the operation and convert electrostatic potentials to sound.

Devices for converting energy from one form to another play a large role in the study of ultrafrequency radiations, and the bolometer is one of these. At first blush it may appear incorrect to include it in the category of instruments other than vacuum tubes, since most bolometers are enclosed in vacuum envelopes. The vacuum, however, is used to minimize gain or loss of heat and acts merely as a thermal or mechanical protector. The essential part of the bolometer is usually a blackened metal disk with a hypersensitive thermocouple; it absorbs all radiant energy in the wavelength band from short radio to long X-ray, converts the energy into heat, and measures the amount of heat so produced. Since heat is a function of energy, the bolometer actually measures the radiant energy in a considerable segment of the electromagnetic spectrum.

Where heat is either the original or end product of an electronic action, thermocouples are frequently used to detect the extent of radiation. They utilize a tendency of metallic atoms to lose electrons when excited by heat. Some metals release electrons easily; others do so with the utmost reluctance. If two metals with different retentive powers are closely connected and heated to the same temperature, the loose-electron metal will shake out the negatively charged



COSMIC RAYS, oscillations above a quadrillion megacycles, top the frequency spectrum. Their presence can be detected by gas-filled Geiger tubes.

particles and the retentive one will grab them. This causes a flow of electrons, or current, which is proportional to the temperature. Thus high frequencies are converted to heat, which is then measured in terms of direct current by an ordinary meter.

Barring the secret and still unpublished discoveries of the war years, electronic devices that operate in the top half of the frequency spectrum are used primarily to measure and study the properties of electronic motion. Prominent in this class is the Wilson cloud chamber, a tube filled with gas and moisture in which movements of electrons cause ionization of the humid gas and produce electronic tracks that are visible to the naked eye. The Geiger tube, similarly, detects cosmic rays through the medium of ionized gas.

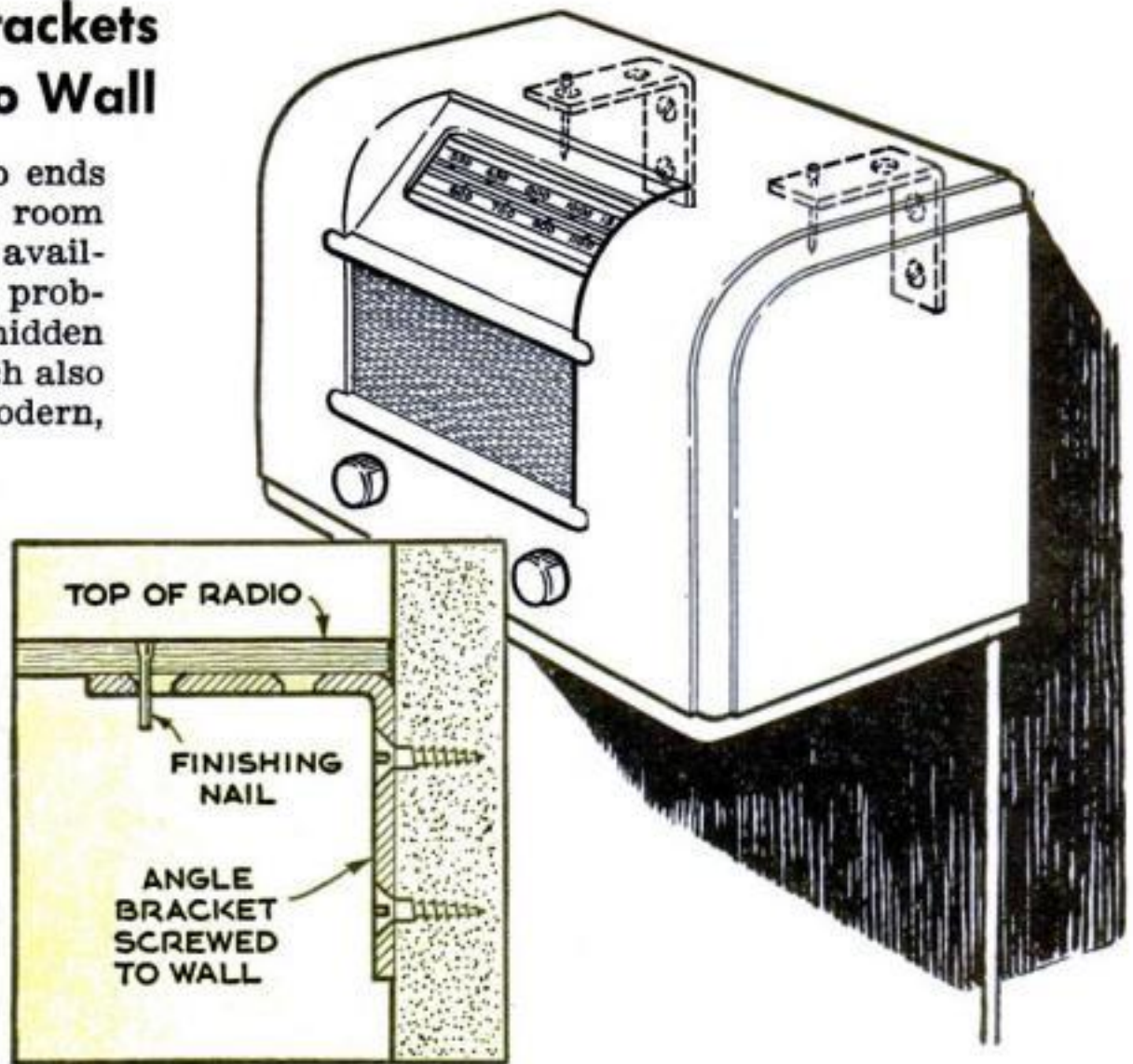
X-rays are electromagnetic radiations in the vicinity of a trillion megacycles; they are produced in nature by the disintegration of radium atoms, or electronically by bombarding a metal target with a beam of electrons at extremely high voltages. Although most X-ray tubes are enclosed in vacuum, as in the case of bolometers, this is an energy-saving convenience rather than an electronic necessity.

Electromagnetic vibrations are not, as is indicated by their name, entirely electrical. This can be demonstrated by magnetizing a bar of iron, cobalt, or almost any of their alloys. Depending on which metal is used, the bar will become longer and thinner or shorter and thicker. This phenomenon is known as magnetostriction and is a mechanical effect produced by magnetic instead of electric fields. Magnetostrictive oscillators analogous to quartz-crystal oscillators have been made.

Hidden Mounting Brackets Fasten Small Radio to Wall

ALL too often a small radio ends up at the wrong side of a room because there's no table space available where you want it. This problem can be overcome by the hidden wall bracket shown here, which also helps to give little radios a modern, "built-in" look. Its cost is negligible.

Before hanging your radio, be sure that the cabinet is sound and the joints are in good condition. Screw two angle brackets to the wall as shown. Finishing nails or small wood screws driven through the top of the cabinet will keep it from sliding off without preventing you from lifting it off when desired. Cut off the ends of the nails.—H. D. POST.



Terminal Strip Helps Experimenters in Testing New Circuits

RADIO experimenters who have to stretch available equipment can adapt a home radio set to supply current at different potentials for a variety of test instruments or "add-on" circuits. Six connections brought out to a terminal mounting strip at the back of the chassis will make it unnecessary to remove the set for every new experiment.

Connect the terminal points to the circuit element indicated in the drawing. Shield the No. 4 connection and hook it to the un-

grounded side of the volume control that connects with the A.F. input to the audio amplifier. Check your radio before making this connection, since not all volume controls are suitable for this use. For a handy continuity and condenser tester, attach a pair of prods in series with a neon lamp as shown. A record player may be connected to Nos. 1 and 4, or a complete crystal-microphone preamplifier can be fed directly into the power output stage.—E. E. YOUNGKIN.

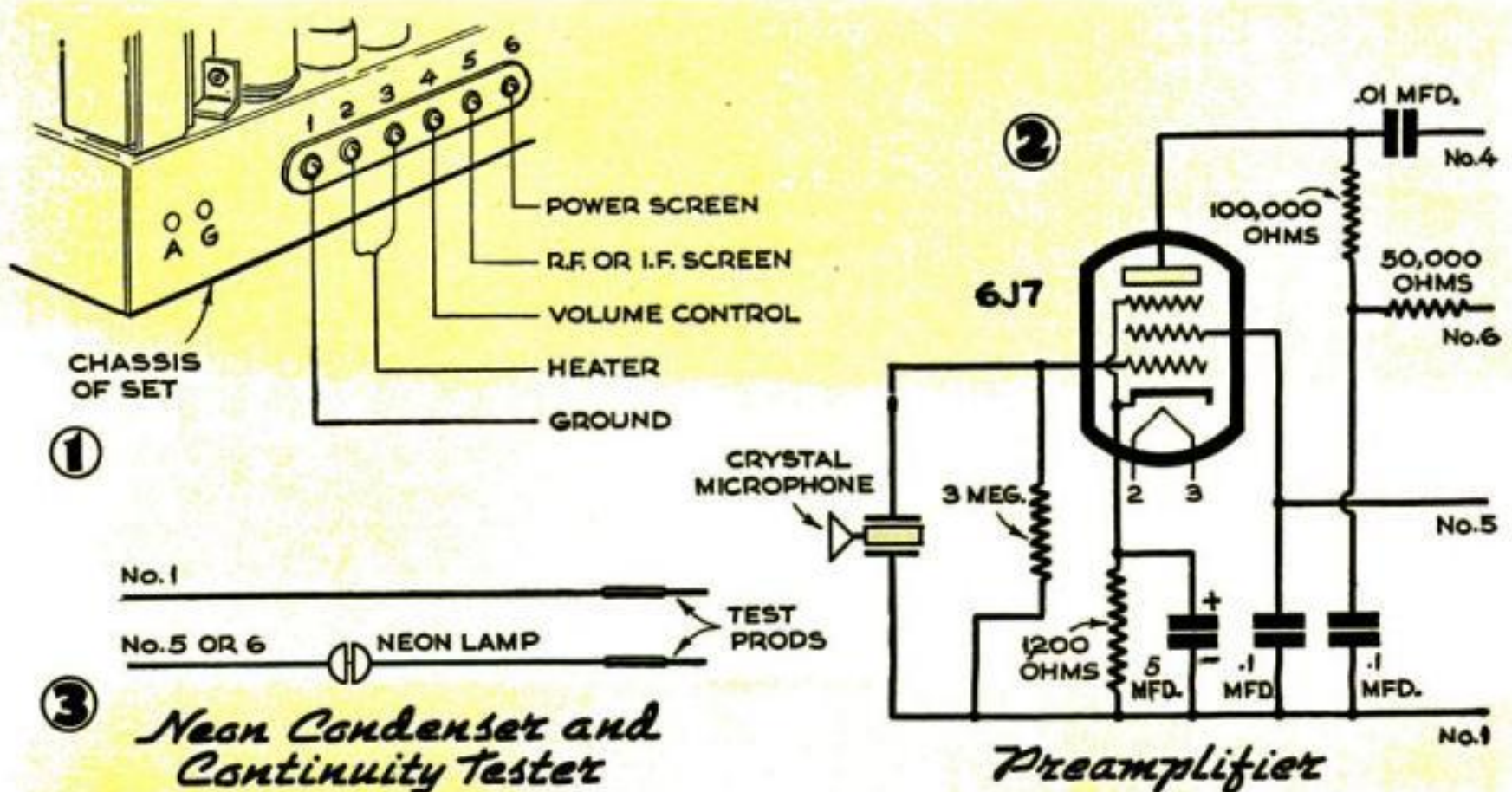


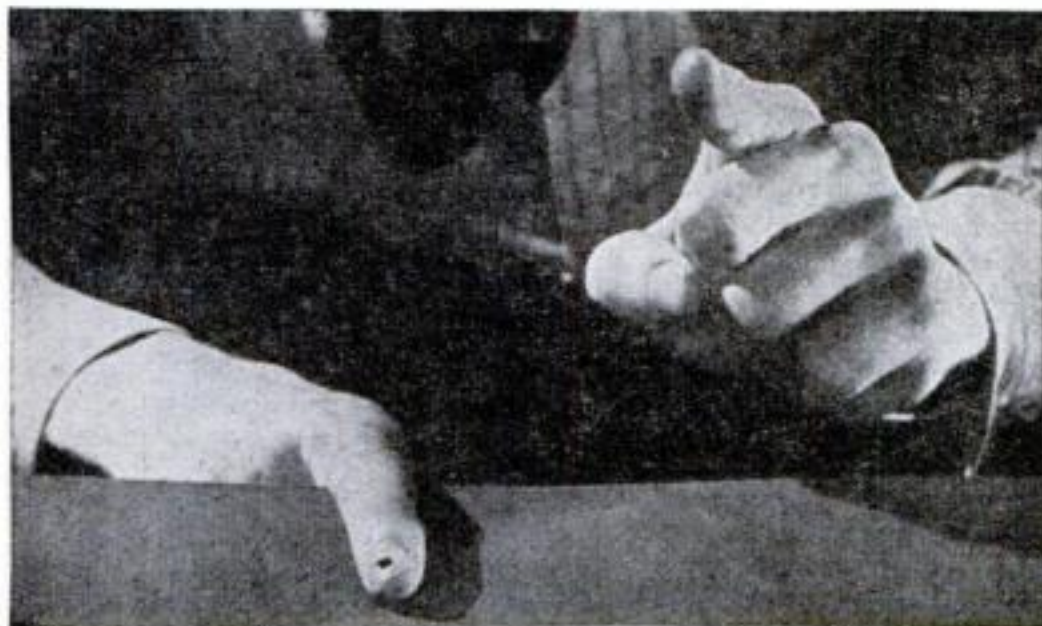
TABLE TRICKS

PULLING A THIMBLE through a handkerchief isn't difficult if you secretly use two thimbles, one fitting loosely over, and hiding, the other. With both on one finger, drape the handkerchief over them, reach under and remove the larger thimble, and put it on again over the handkerchief. Now grasp the handkerchief by the corners and whisk off the larger thimble. Your friends will be startled to see a thimble still on your finger.



ONE BLACK CHECKER in the center of a stack of six reds will change color at your command as you lower a tight paper tube over the stack and lift it off again. The black checker is really a fake—a red one over which a black paper ring fits loosely! Soap the tube to make the paper adhere.

FEW COAT POCKETS are designed to carry a full glass of water, and so friends will get a jolt when you pull one out and take a deep drink! They won't know you have kept it from spilling with a piece cut from a toy balloon and held on by a rubber band. Slip off the cover as you reach in your pocket, and steady the glass with your hand.

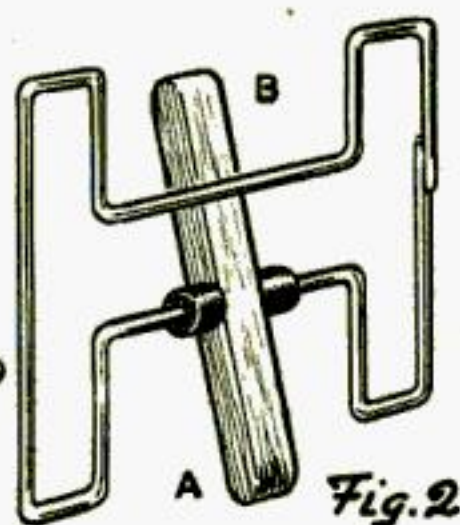
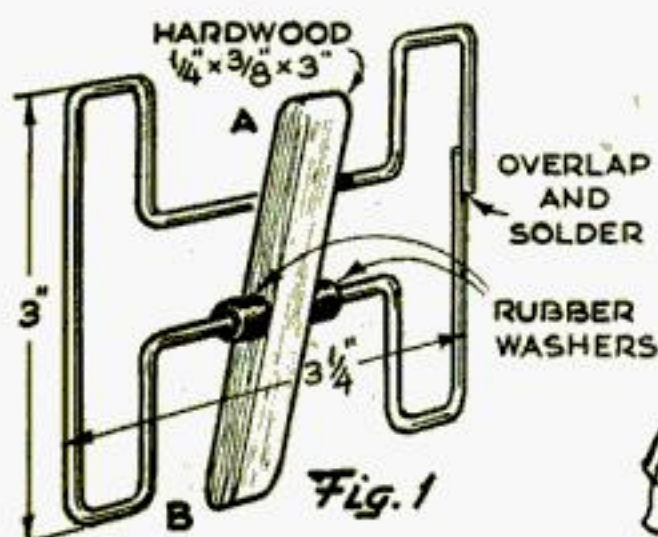


SPOTS BEFORE THE EYES of your friends will vanish mysteriously and return again if you work this trick with dexterity. Put a spot on the nail of both forefingers with a soft pencil or ink. Then sit at a table with the two spotted fingers extended on it and the others doubled into your palms. To make a spot vanish, raise your hand and, just as you are lowering it again, quickly double back the forefinger and extend the second finger in its place! Act quickly and keep the rest of your hand hidden.

DISAPPEARING PENCIL. Sit with a table between yourself and your audience and roll what appears to be an ordinary pencil loosely in a sheet of paper. Then tear the roll in two, unroll the halves—and the pencil will have disappeared! The pencil, of course, is a fake—a pencil-size roll of colored paper with the point and the eraser of a real pencil glued into the ends. Before unrolling the torn halves of the rolled paper, hold them low and let the ends of the fake pencil fall into your lap.



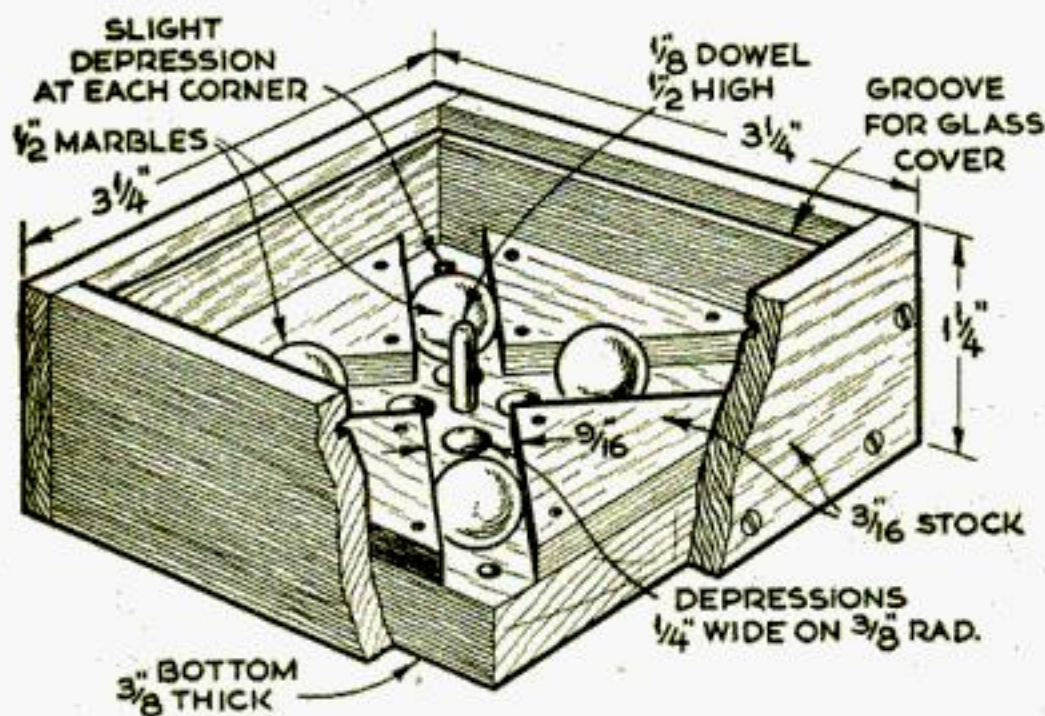
MAGIC YOU CAN MAKE



QUICKER THAN THE EYE, this trick fools many astute observers—at least for a time. The object is to make the hardwood strip, *AB* in Fig. 1, go through the wire and appear on the other side as in Fig. 2. It can't, of course, but you can make it seem to do so by pressing the wood against the frame and snapping

your finger off so the strip rebounds in almost a complete turn. Movement is too fast to be seen.

Slip on the washers and wood before bending the coat-hanger wire. Friction of the washers against the wood minimizes all but the desired rebound.—GEORGE BARR.

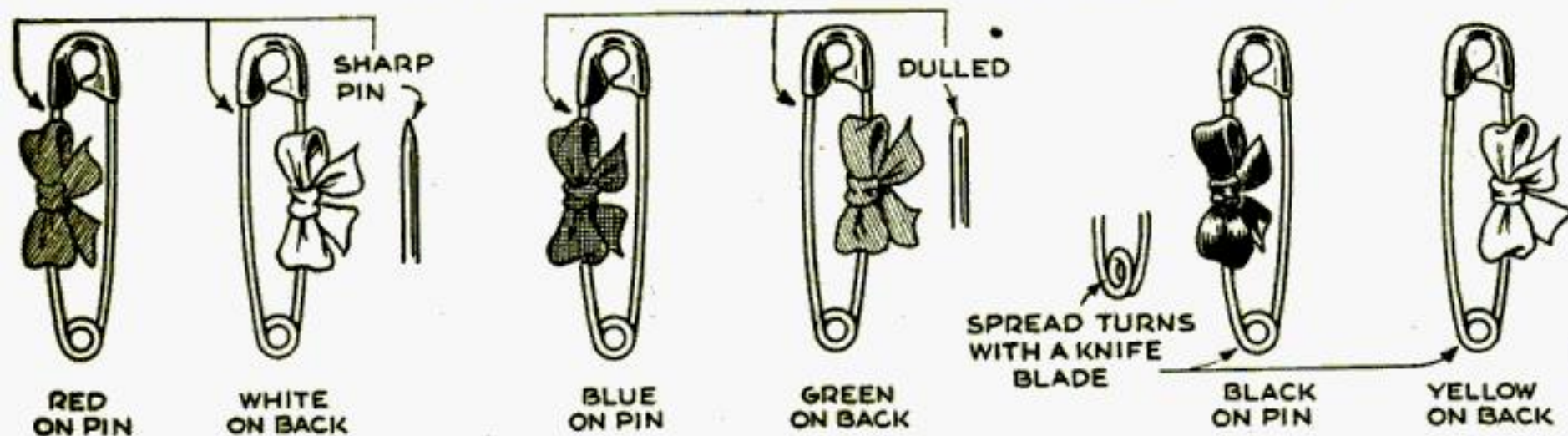


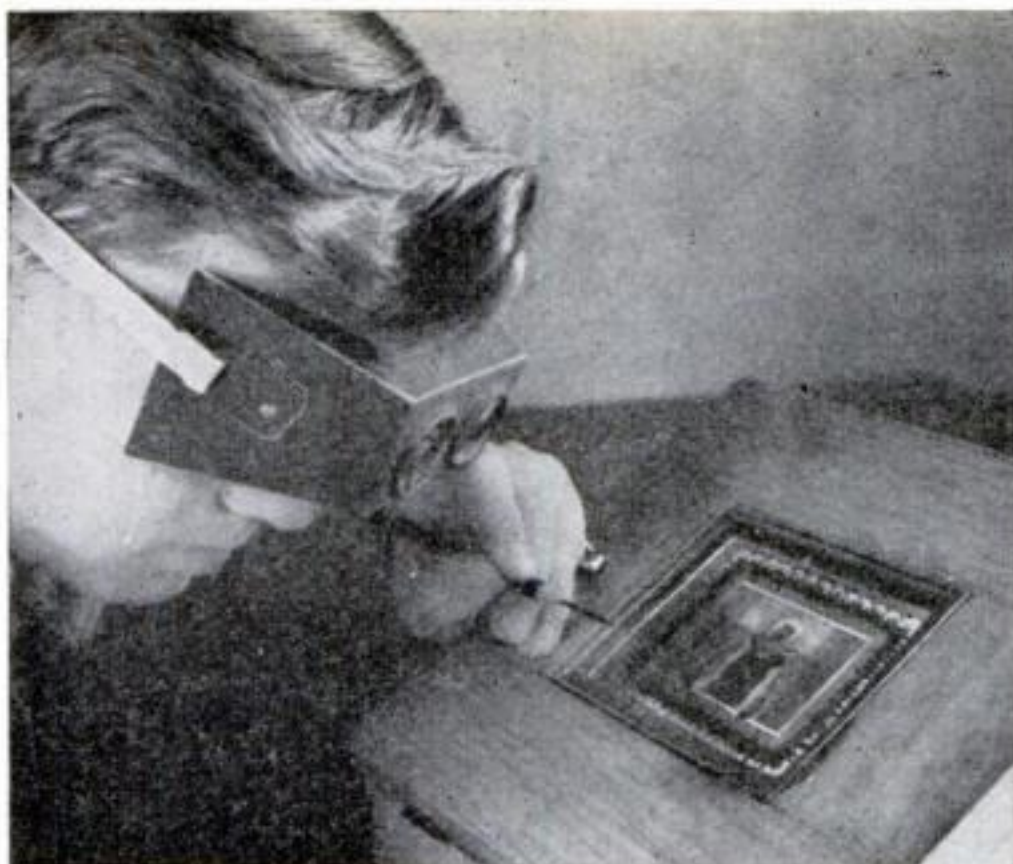
APPLIED SCIENCE, and nothing else, solves this puzzle. Make a box to the dimensions shown and cover it with glass. Now try to get the four marbles into the four corners at the same time.

Your friends who aren't in on the secret, or who don't remember their science, will twist and turn the box to no avail. One or more of the marbles will always run back toward the center. But centrifugal force will turn the trick. Just spin the box sharply, and the marbles will all run to their corners as if guided by some magic hand. Without this simple solution, the puzzle can be baffling.—G. B.

THERE'S A POINT to this trick done with six safety pins and a set of small bows of differently colored ribbons. Blindfolded, you can pick one of the pins from a hat, or have a friend put one in your hands held behind your back, and almost immediately you can name the color of the ribbon tied on it. The code is in the drawing below. Half the bows

are on the back of the pins, half on the pin side; two of the pins have sharp points, two have their points dulled; and two have the spring turns spread just enough to admit a fingernail. Your touch and the memorized code are all that you need. For instance, if the ribbon is on the pin side and the point is sharp, it's a red ribbon.—G. B.





HEADBAND MAGNIFIER LEAVES HANDS FREE

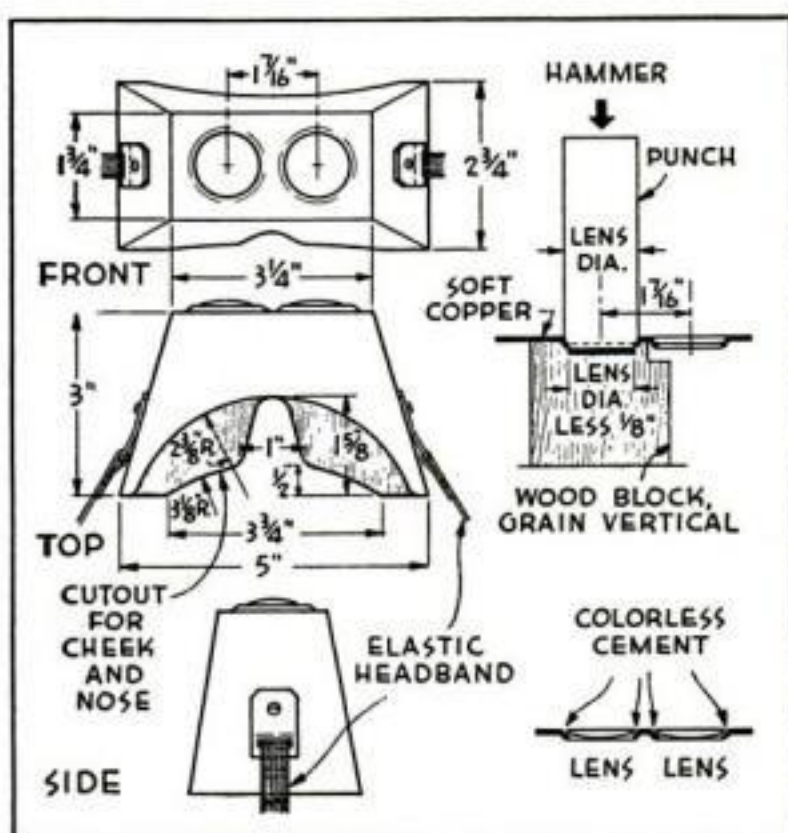
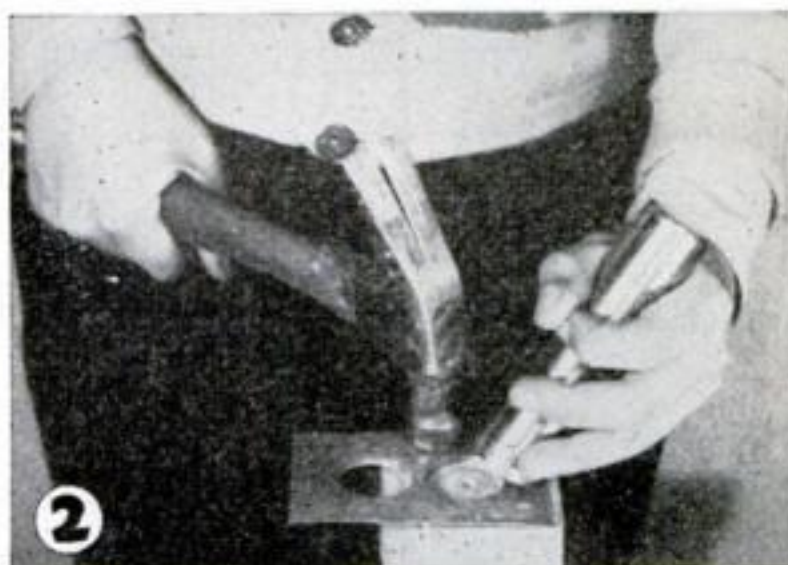
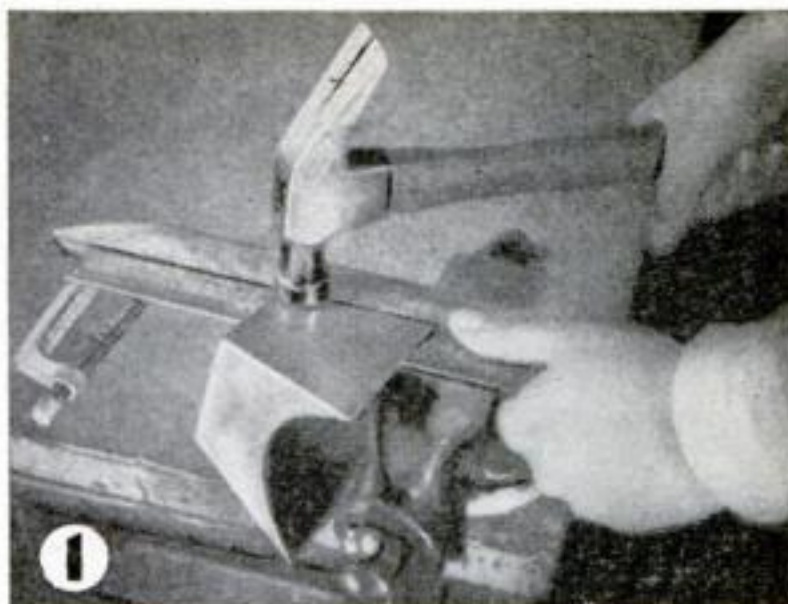
By Jack Mellinger

IF YOU have ever tried to adjust or assemble a mechanism where you needed a magnifying glass to see the parts clearly, you know how essential it is to have both hands free. On occasion, practically all mechanics, hobbyists, and photographers have felt the need of a magnifier that would not hamper manipulation of tools. Here is a headband, binocular-type unit designed to fill the bill. It may be worn over eyeglasses.

Stationery and dime stores often carry inexpensive magnifying glasses in powers from two to 10, or you may use low-cost chipped-edge lenses. The magnifier shown has 6" focal-length lenses of around $4\frac{1}{2}$ power. To get a binocular effect at close distances some experimenting may be necessary with the lenses held in cardboard. For lenses $1\frac{3}{16}$ " in diameter, the writer finds that a $1\frac{7}{16}$ " separation between centers is about right.

Make a paper template to fit the contours of your face, and from it cut thin sheet metal for the frame. The metal may be anything from tin-can stock to 18-gauge copper. Bend the frame, as shown in Fig. 1, solder the joints, and cut out the lens piece from the same stock.

Recessed holes for the lenses are punched with a tool turned in the lathe to the shape shown in the drawing. Rest the plate on end grain of a small softwood block, as in Fig. 2. The lenses are cemented in with ordinary colorless household cement, and excess cement is scraped off with a knife after it has dried. Solder in the lens piece, and finish inside and out with black lacquer. The two parts of the frame and a template are shown in Fig. 3.



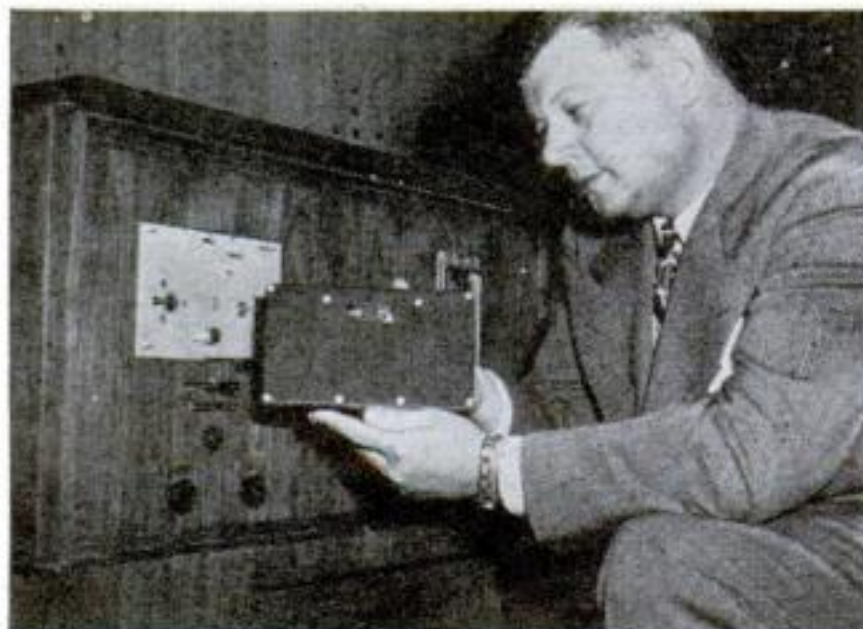
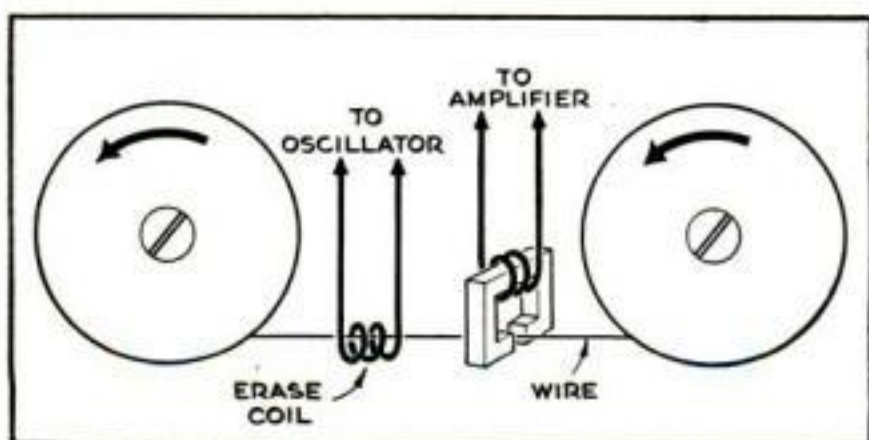
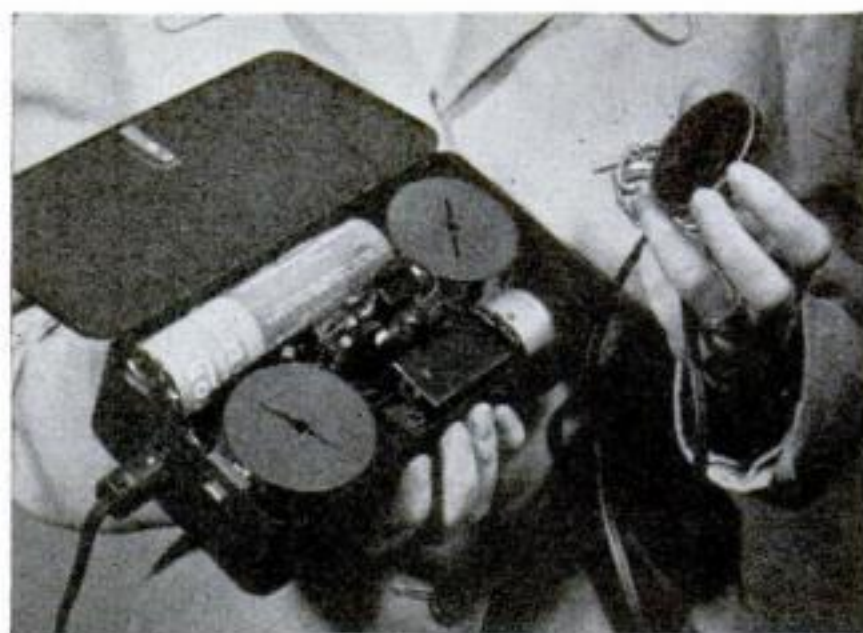
Radio-Controlled Planes Tow Antiaircraft Gunnery Targets



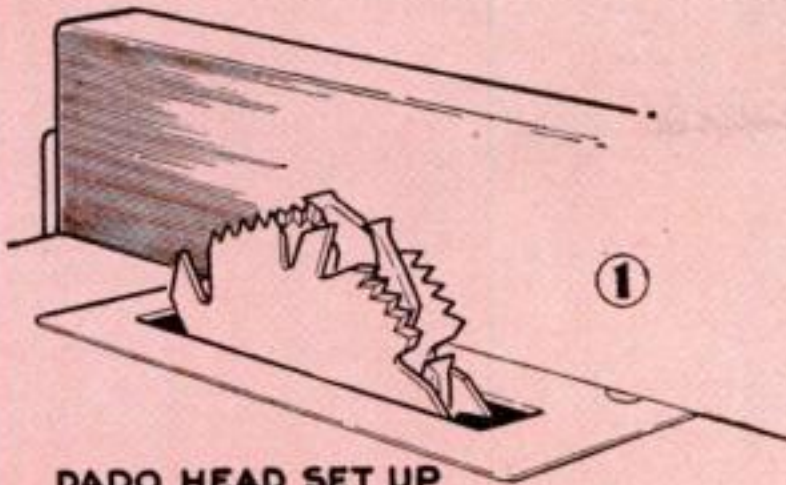
LONG envisioned as an ultimate weapon of war, radio-controlled robot planes have been put to use by the U. S. Army for towing targets that test the skill of antiaircraft gunners. As employed overseas by the U. S. Seventh Army, the robots are miniature high-wing mono-planes, powered by two-cylinder air-cooled engines having coaxial contrarotating propellers. The upper photo at the left shows two Army technicians trying out the radio controls before sending up a plane, which begins its flights on the portable launching ramp at the lower left. Since wind conditions usually make a conventional landing risky to the plane, it is landed by means of a parachute that is ejected at the touch of a remote-control button. The plane can be put through evolutions that closely simulate those of enemy planes, and gunners can track the towed target without the danger involved when piloted planes are used.

Wire Recorders Made in Pocket Size or as Radio Attachments

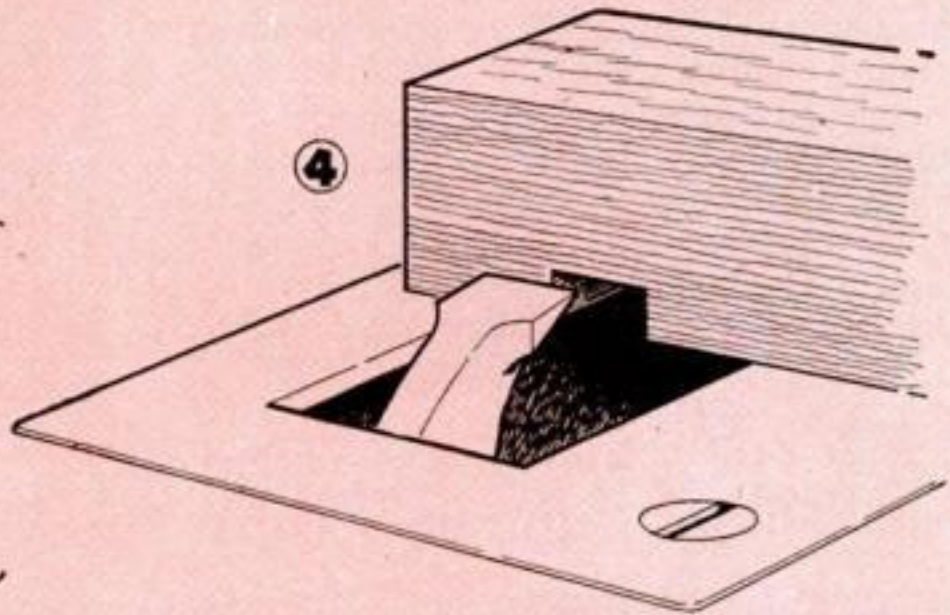
WIRE recorders like the one pictured at the right have been reduced in size and weight until they now fit the pocket and can be carried anywhere for on-the-spot pickups. Designed by the Armour Research Foundation, of Chicago, this 3-lb. battery-powered model magnetically records sound on wire almost as fine as human hair. For playback, the wire spools can be transferred to a larger device. The small instrument seen at the lower right, which attaches to a radio, is manufactured by Lear, Incorporated, of Chicago. It contains the circuit elements shown in the diagram and can be connected to a suitably fitted radio for recording, erasing of previous impressions, or reproduction of impressed sounds.



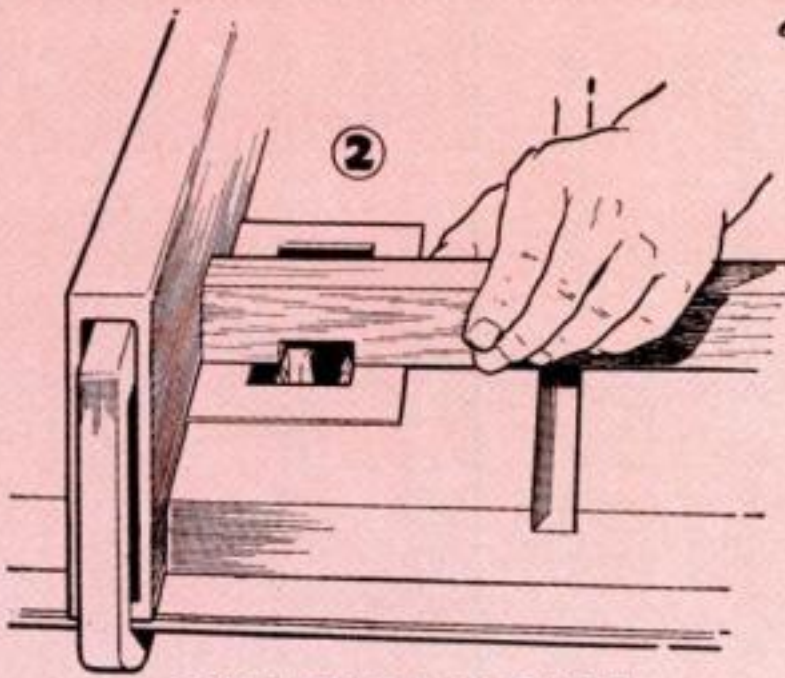
What's Wrong?



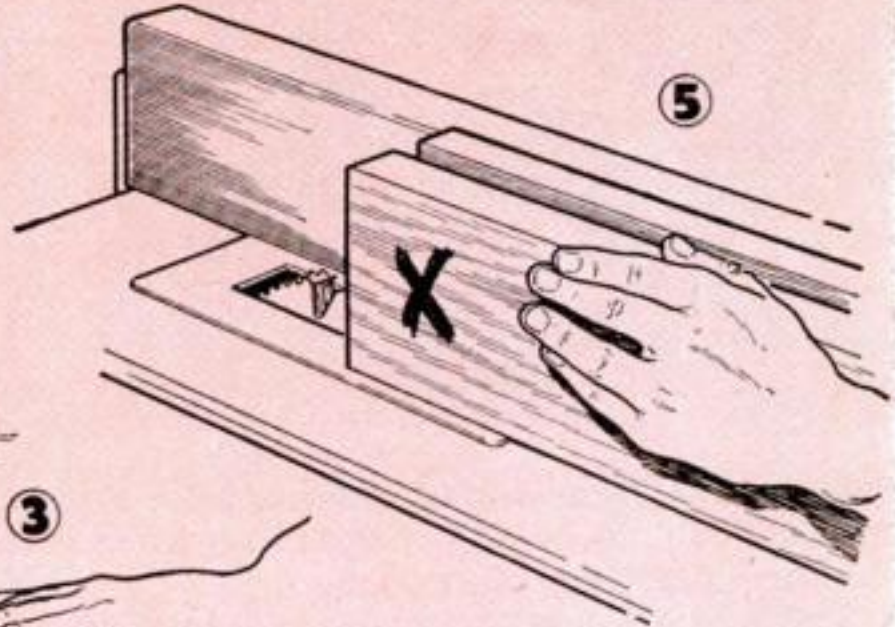
DADO HEAD SET UP FOR 3/4 GROOVE



USING CHIPPER TO CUT A DADO



USING FENCE AS GUIDE IN CUTTING A DADO



GROOVING BENCH-TOP MEMBER FOR A SPLINE



GROOVING SHAPED WORK

THESE are all setups for the circular saw. Some would work after a fashion; others would not work at all. In each case there is a correct, efficient way to do

the job. Can you tell what's wrong? After you have written down your answers, turn the page upside down for the correct ones given below.

4. Chipper alone will not cut smooth dados. If a dado is too narrow for dado saws in combination, use one or both saws alone.
5. The working face of the stock should be pressed against the fence in cutting both grooves so equal distances from the face edges to the grooves will be insured. If grooved as shown, faced surfaces might be at different levels on assembly.

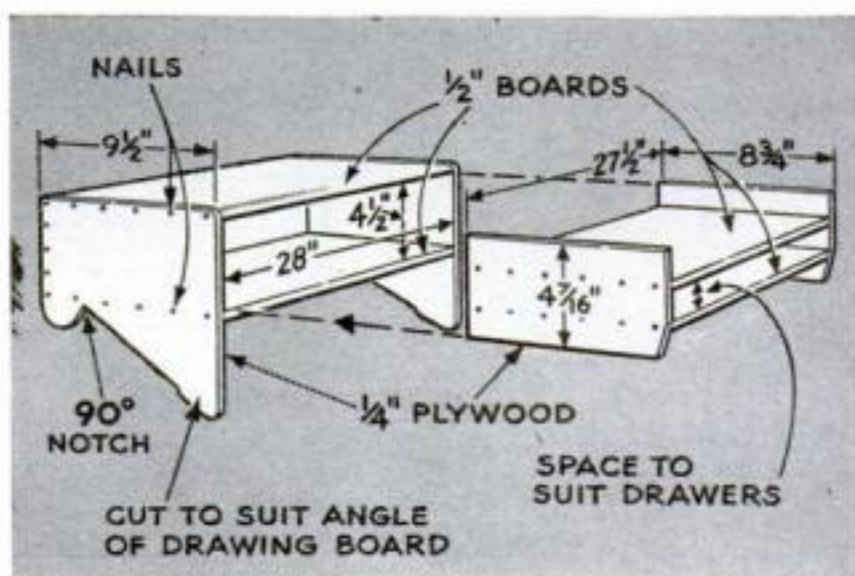
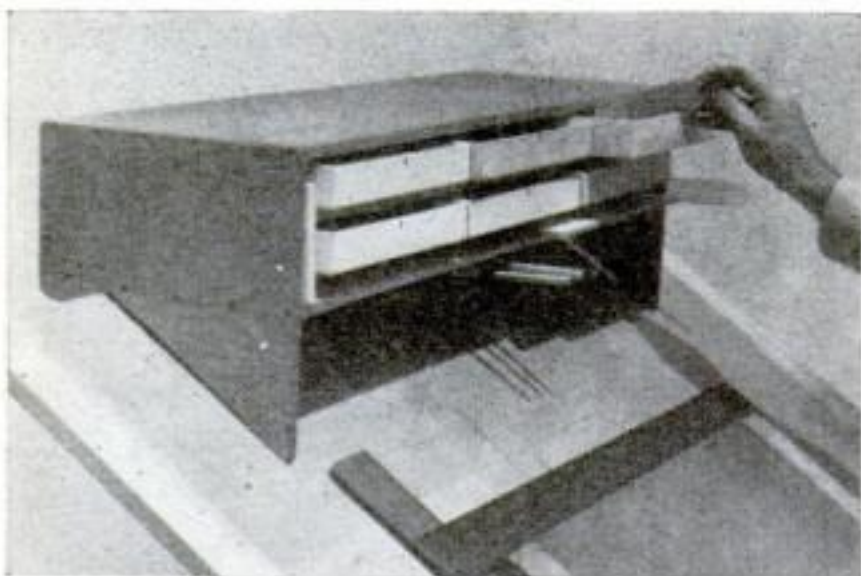
ANSWERS: 1. The chipper, or inside cutters, are mounted backwards and will not cut.
2. Narrow ends offer little support work and injure the hand. The piece should be held against a miter gauge.
3. A piece with a straight edge parallel to the groove should be tacked to the top of the work to slide against the fence.

Paint Can Becomes Sand Pail

IF YOU have a discarded paint container with the handle still attached, it can be transformed into an attractive and sturdy sand pail with little effort. Remove the rim with a close-cutting can opener, leaving no sharp edges, and clean up the can with paint remover. Give the exterior two coats of white paint and decorate with decalcomanias, paint the interior a light yellow, and the pail is ready for use on the beach or backyard sand pile.—MRS. W. A. BLACK.



Easel Filing Cabinet Keeps Drawing Materials Within Reach



DESIGNED to fit on the uptilted edge of an easel, this cabinet holds paper, instruments, and other drawing materials within easy reach. To keep down the weight, make it of $\frac{1}{2}$ " stock with plywood ends and use cardboard boxes for the drawers. If the

shelving is assembled as a unit so that it will slide into the shell, you will be able to alter the shelf spacing later if a new arrangement becomes desirable. The underside of the shell makes a handy spot for a coil-spring pencil holder.—J. MODROCH.



Pencil Clip Used to Paint Stripe

YOU can do a neat paint-striping job with an ordinary camel's-hair brush such as used by artists if a pencil clip is slipped over the ferrule and clamped into the position shown at the left. The ball of the clip will serve as a guide, keeping the brush tip from dragging heavily across the work and making the stripe uneven. Use pliers in order to crimp the clip on.—SIGMUND SAMETH.

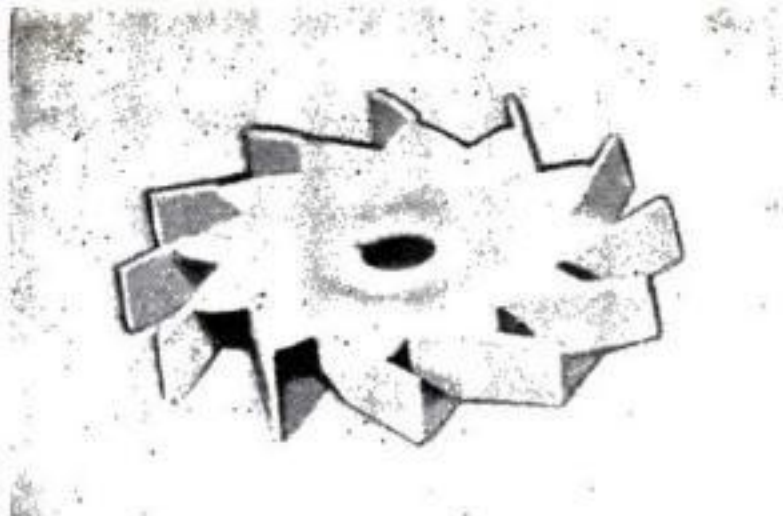
MORTISE AND TENON



"I said cut a rabbet, not a rabbit!"

Question Bee

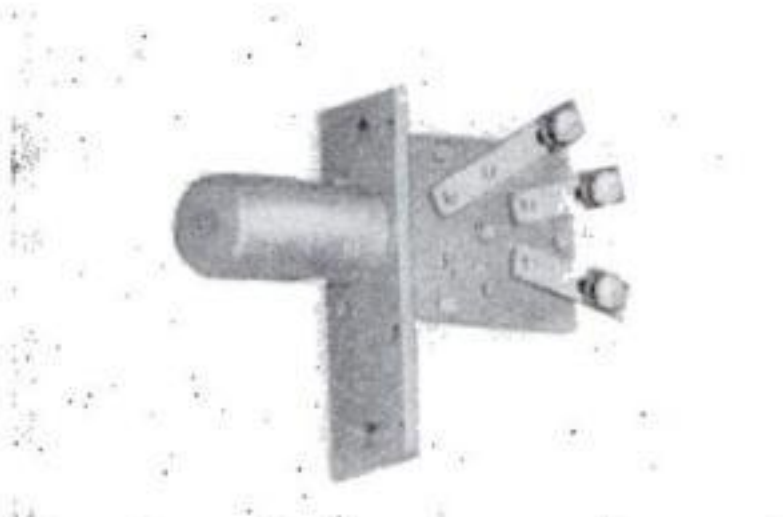
CAN YOU NAME THESE
AUTO ELECTRICAL PARTS?



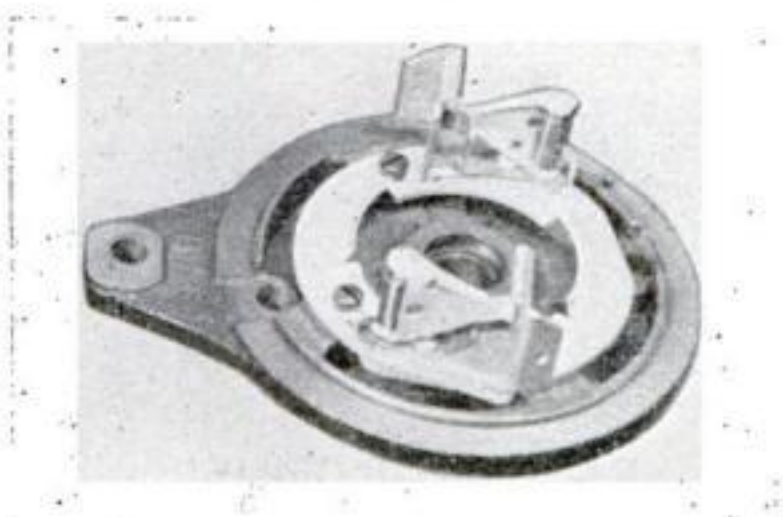
1



4



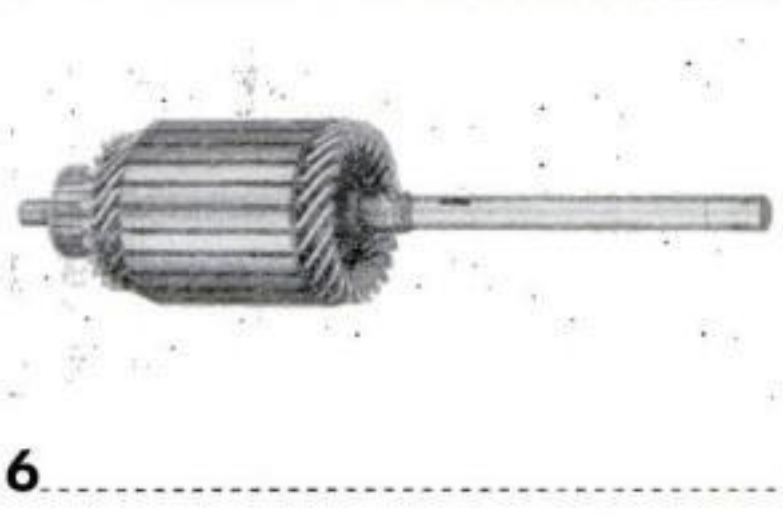
2



5

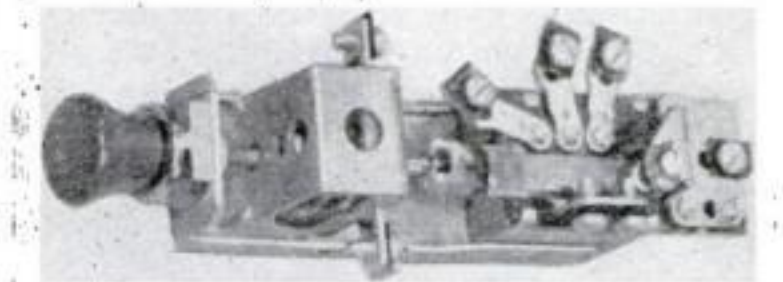


3

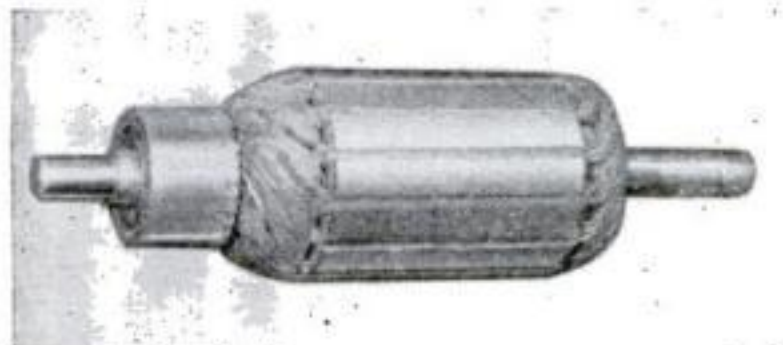


6

WHAT do you know about the electrical system of your automobile? One or two of the parts shown here may be puzzlers, but most of them will be duck soup for the driver who tinkers with his car. Write your answers in the spaces provided; then check them with the correct ones given upside down below.



7



8

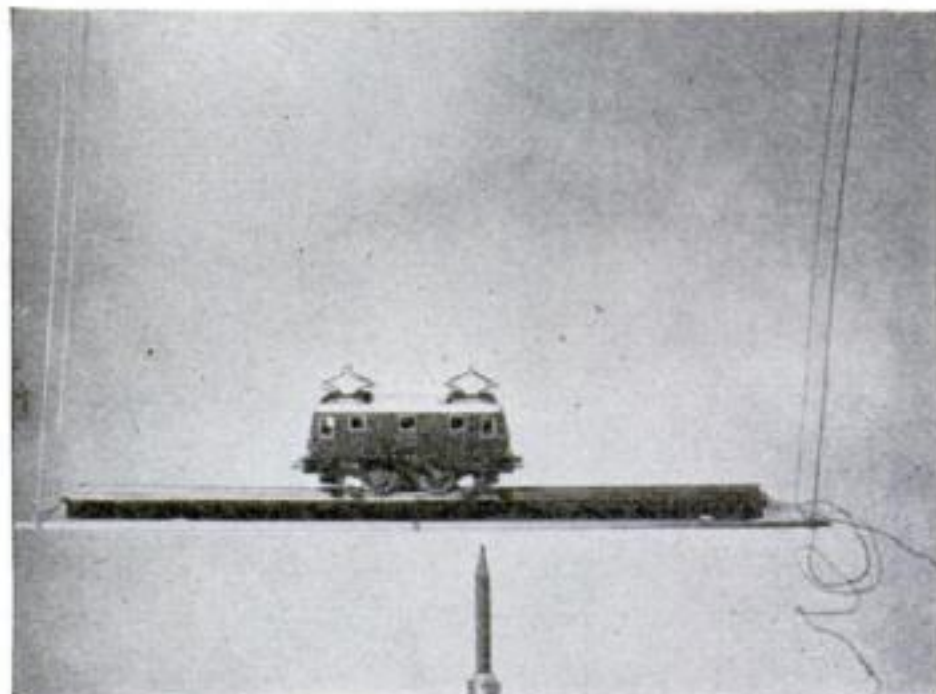
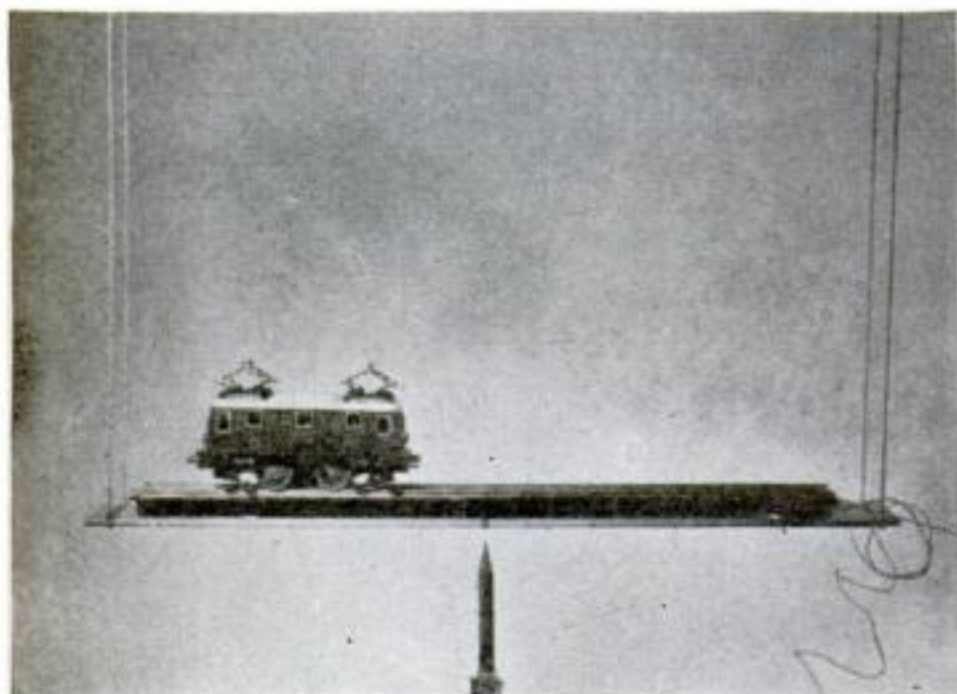
1. Generator fan.
2. Headlight beam-selector switch.
3. Distributor contact points.
4. Condenser.
5. Generator end with brush-holder ring.
6. Starting-motor armature.
7. Light selector switch.
8. Generator armature.

ANSWERS

Photos courtesy Delco-Remy.

HOME EXPERIMENTS SHOW NEWTON'S

In 1686 Sir Isaac Newton formulated the principle that every action has an equal and contrary reaction. Jet-propelled planes, V-1 bombs, and rockets are among the latest applications of Newton's Third Law of Motion. These five experiments with everyday material graphically reveal the existence of this physical law.

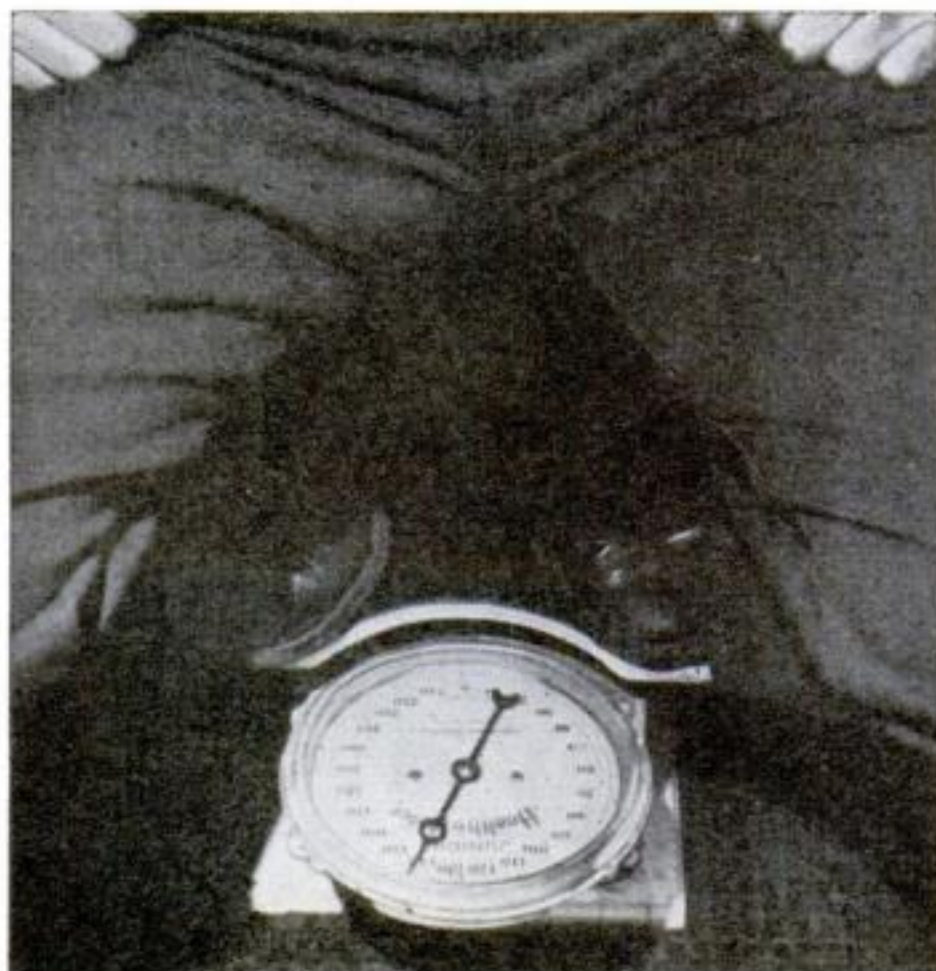


WHEN TRAINS OR AUTOMOBILES travel forward, they push backward on the tracks or road. This manifestation of Newton's Third Law of Motion can be demonstrated with a toy electric locomotive set up on a board suspended by strings or wires at each corner so that it is free to swing forward or backward. When current is applied, the locomotive moves forward, as would be ex-

pected. But simultaneously, because of the reaction, the tracks and board swing in the opposite direction, as shown by the pointer. This force of reaction has been harnessed and put to work in such devices as treadmills and walking exercise machines. When these mechanisms are used, the effort that normally would produce forward movement makes the "ground" move backward instead.

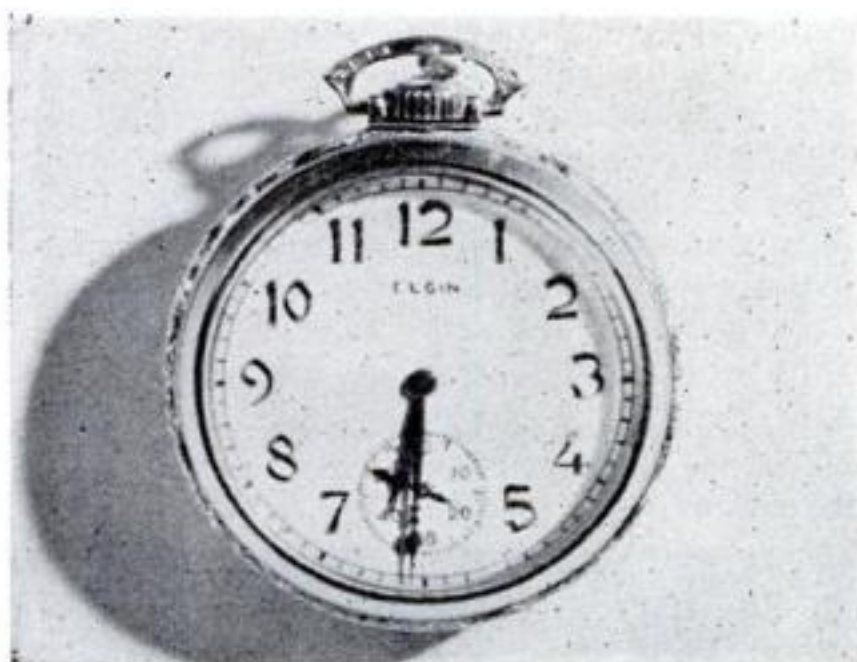
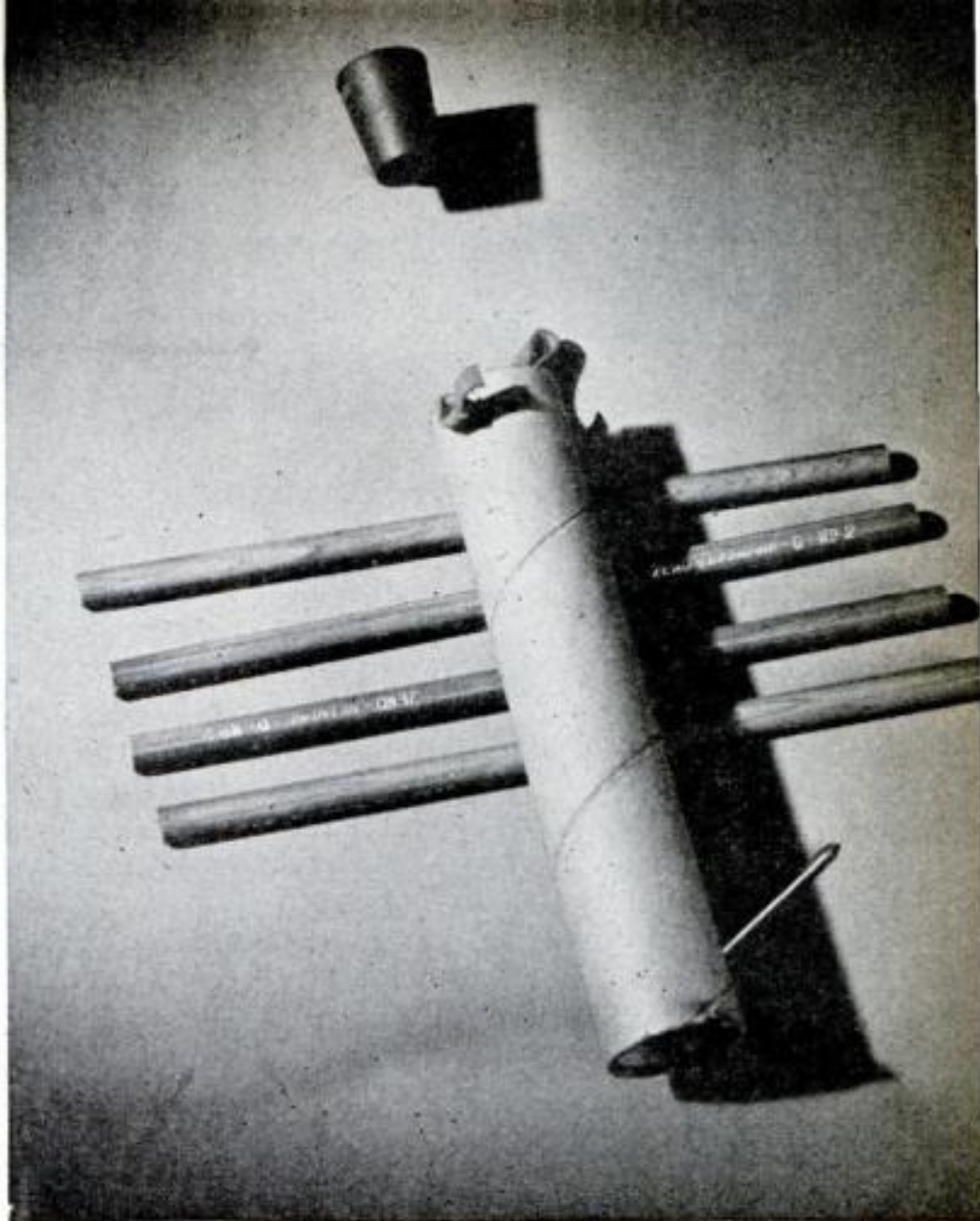
CROUCH ON A SCALE and notice your weight. Now, quickly raise yourself to an erect position, watching the scale dial as you do so. Momentarily, while you are rising, you gain a substantial number of pounds. Why? Because the action involved in giving yourself an upward velocity produces an equal reaction downward, and the latter is added to your normal weight. Converse-

ly, if you start from an upright position and squat down quickly, the force exerted on the scale will be considerably diminished and, for the time being, you will be many pounds lighter. This test of Newton's Third Law shows why you must stand still on a scale in order to read your weight accurately. A bathroom scale with a horizontal dial is ideal for the experiment.



THIRD LAW OF MOTION

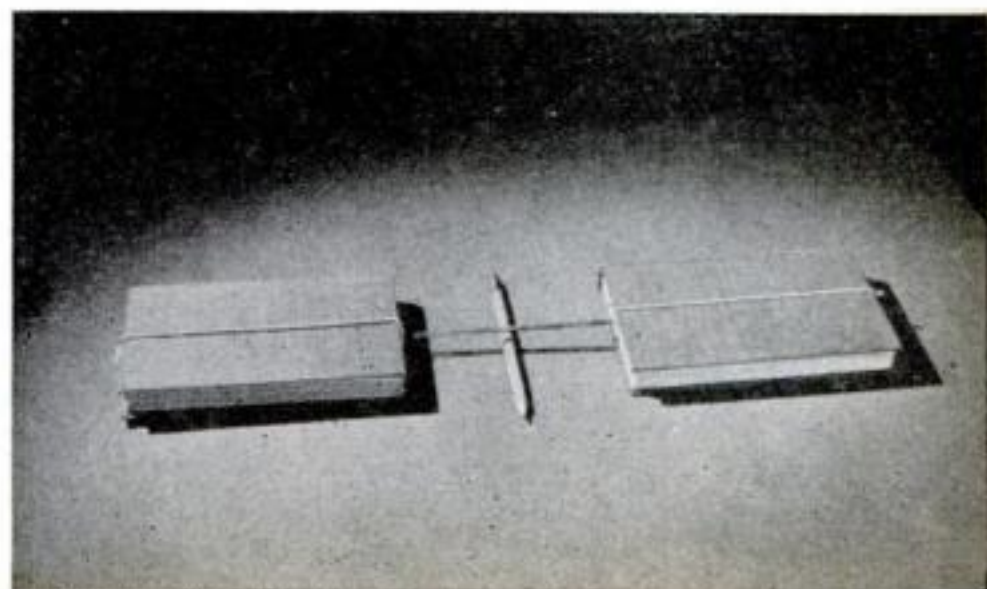
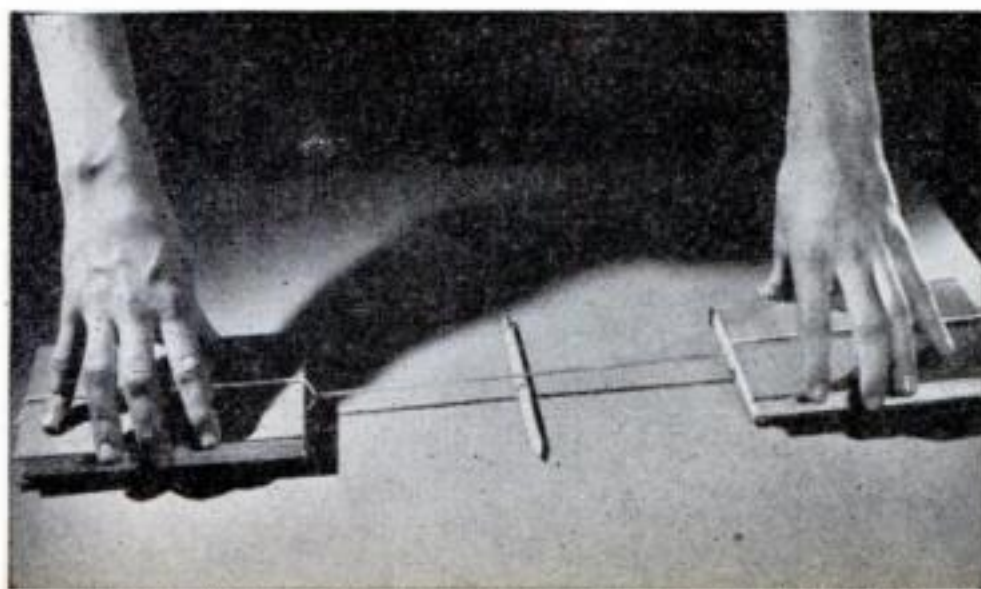
IF TWO OBJECTS are forced apart or pulled together, the momentum imparted to each is equal. This principle, called the conservation of momentum, also is a part of Newton's Third Law of Motion. You can demonstrate this with a toy gun made from a mailing tube and a rubber band. Place a loose-fitting rubber stopper against the stretched rubber band and hold it in place with a string looped over a nail across the end of the tube. Rest the gun on several pencils. "Fire" it by touching a match to the string where it passes over the nail. As the projectile flies forward, the tube rolls backward. If you could measure it, you'd find the backward momentum imparted to the gun was equal to that given the projectile.



HANG A WATCH on a nail and carefully balance it. If properly hung, the watch soon will begin swinging rhythmically—demonstrating that Newton's Third Law is operative wherever any motive force is involved. In this instance, the escapement action in the watch kicks back on the watch itself, just as a bullet speeding from a gun gives a backward kick to the weapon. Ordinarily, the inertia of the watch and the fact that it is kept from accumulating movement like a pendulum prevents this kick from being translated into actual motion.

TIE A STRING around each of two books of equal weight, and connect the two strings by means of several rubber bands linked together. Lay the books on a smooth surface, separate them so that the rubber bands are stretched, and place a marker exactly midway between them. If you release the books at exactly the same instant and

the surface on which they are resting is uniformly smooth, each will be drawn toward the marker exactly the same distance—another demonstration that action and reaction are equal. If one book were heavier than the other, the heavier would move a shorter distance, but the momentum imparted to each would be the same.



Carbon Dioxide...

THE BREATH OF LIFE

By Kenneth M. Swezey

YOU can't see it, smell it, or taste it, and the earth's atmosphere contains only three or four parts in ten thousand. Yet, without this trace of invisible, unsmellable, untastable carbon dioxide gas, life could not go on. By some miracle of synthesis which laboratory chemists have never been able to duplicate, green plants aided by sunlight wrest the carbon from carbon dioxide and combine it with water to form sugar and starch.

So that the supply of carbon dioxide may continue undiminished, nature has provided means of constant replenishment. Men and animals eat plants as food, oxidize this food, and give back carbon dioxide in their exhaled breath. The give-and-take is a never-ending process.

Breathing, of course, is not the only means of replenishing the supply of carbon dioxide in the atmosphere. It is produced when any substance containing carbon—coal, wood, oil, and so on—is burned. Decaying and fermenting plants also loose it.

Carbon dioxide is as harmless, in itself, to the human body as water, although a person placed in a pure concentration of the

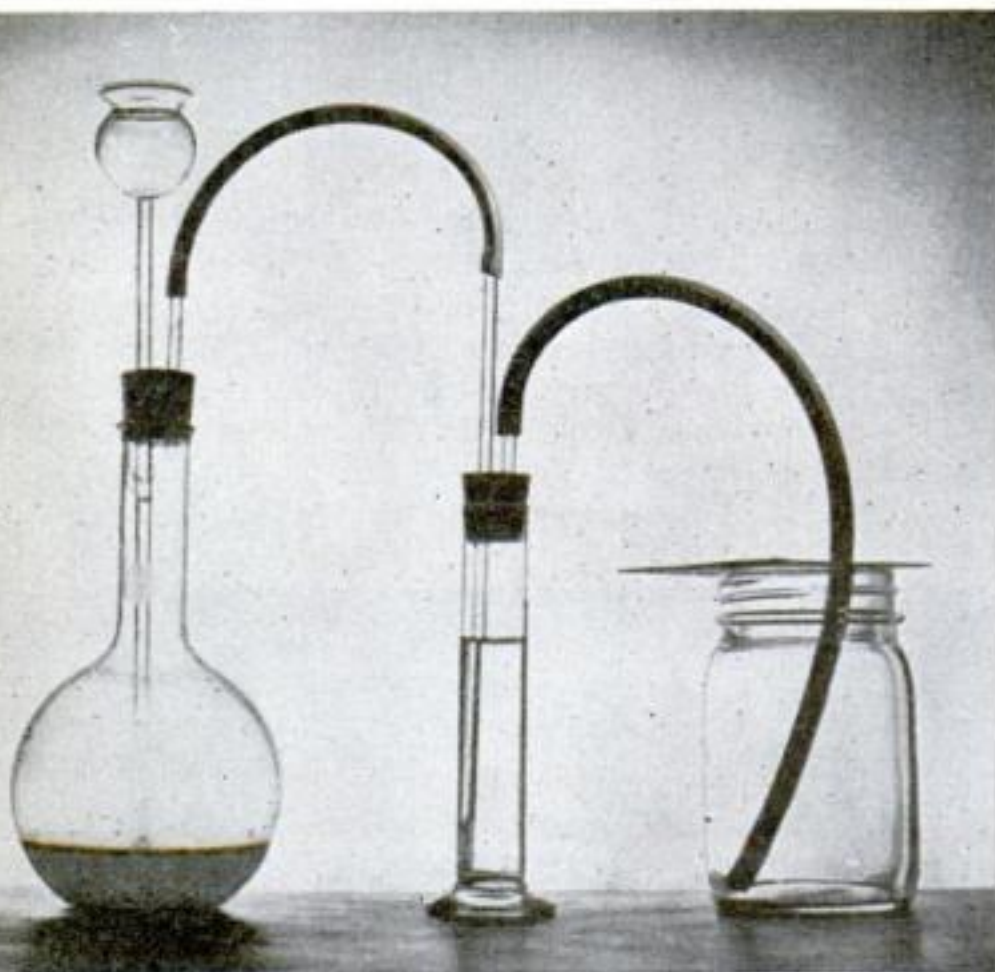
gas would suffocate as surely as one wholly immersed in water. However, carbon dioxide (CO_2) is not to be confused with deadly carbon monoxide (CO), which can kill if only a small amount is present in air that is breathed.

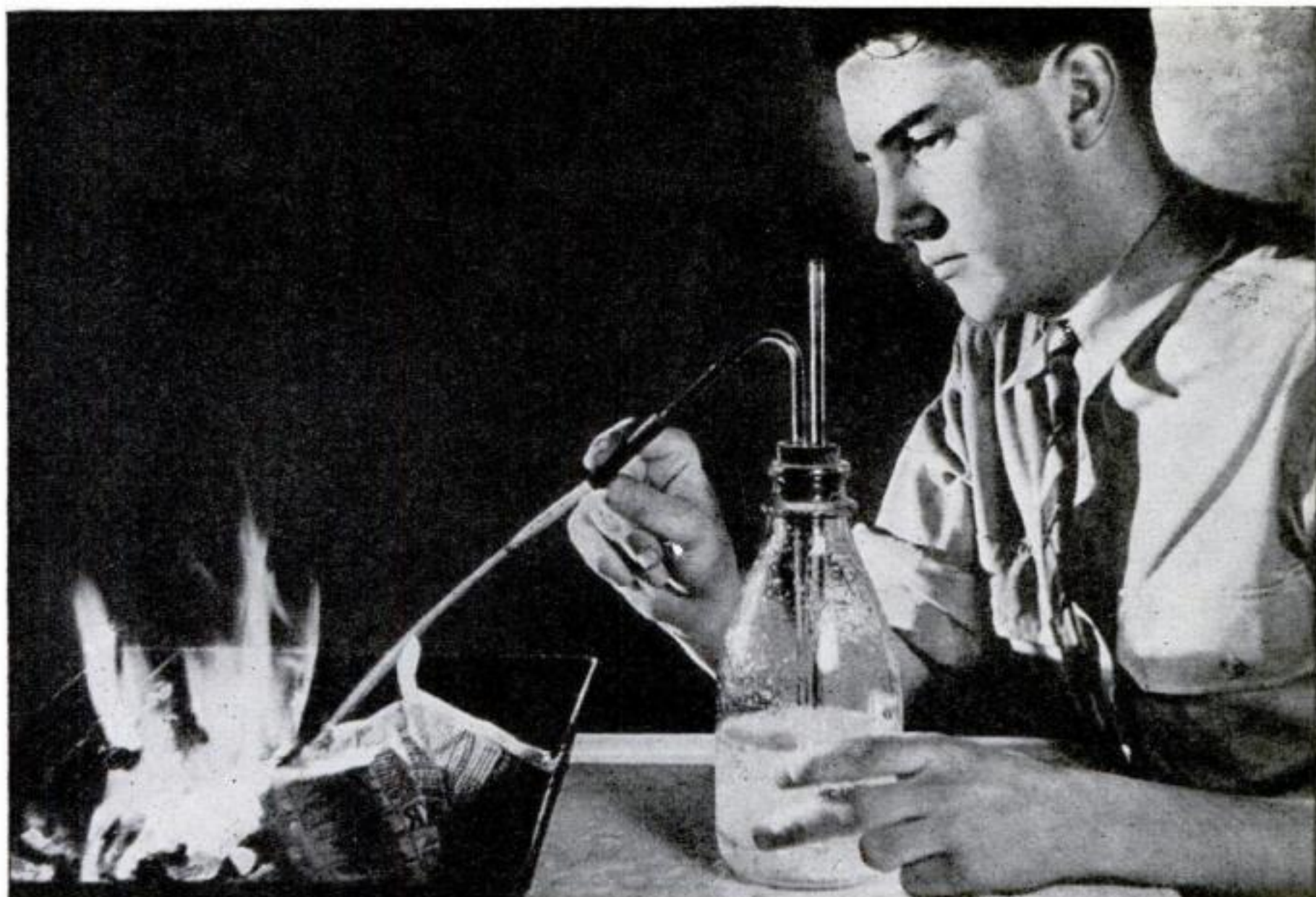
Besides providing building material for living things, carbon dioxide is of great commercial importance. Because it is about one and one-half times heavier than air, does not burn or support combustion, and can be cheaply produced, carbon dioxide has become, next to water, the most important material for extinguishing fires. In solid form, it is the familiar "dry ice." In baking, it makes bread and cake light and more easily digested. In soft drinks, it provides zest and sparkle.

In the laboratory, the easiest way of generating this interesting gas is by reacting any carbonate or bicarbonate with any common acid. Because of its cheapness, calcium carbonate, in the form of small lumps of marble, limestone, or chalk, is generally reacted with dilute hydrochloric acid.

You can make a simple generator from a 500-ml. flask fitted with a two-hole stopper. Push a thistle tube, adjusted to reach nearly to the bottom of the flask, through one

Carbon dioxide will form if you pour hydrochloric acid through a thistle tube on water-covered marble chips in the flask at the left. The gas is washed with water in the center cylinder and collected in the jar. Baking powder, warm water, and gelatin produce the carbon dioxide foam in the tumbler at right.





Baking powder and acetic acid in a milk bottle make a working model of a carbon dioxide fire extinguisher.

hole and a short, straight outlet tube through the other. You can wash the gas by bubbling it through plain water contained in a cylinder or second flask. Since the gas is heavier than air, it can be stored merely by leading the delivery tube to the bottom of the collecting jar and by covering over the top of the latter with a piece of cardboard to minimize disturbance of the gas and air.

Operate the generator by carefully dropping in pieces of marble to a depth of about $\frac{1}{2}$ ", and add enough water to cover them well. Next, slowly pour hydrochloric acid into the thistle tube until gas begins to be evolved vigorously. Add further acid when the flow of gas diminishes.

One of the most common types of fire extinguishers is just a modification of this generator. For extremely rapid evolution of gas, however, the carbonate (usually sodium bicarbonate) already is in solution. When the extinguisher is inverted, concentrated sulphuric acid, contained in a loosely stoppered bottle, mixes with the bicarbonate. Carbon dioxide, quickly formed under considerable pressure, then forces the carbonated water out the hose.

With a milk bottle and a few bits of



glass and rubber tubing you can make a working model to demonstrate the principle of this extinguisher. Fill the bottle three-quarters full of concentrated solution of bicarbonate of soda (baking soda). Through a two-hole stopper thrust one end of a bent glass tube so that it extends nearly to the bottom. Through the other hole push a glass stirring rod to which you have attached, near its lower end by means of a rubber band, a small vial or test tube of concentrated acetic acid. (Acetic acid is safer to use in this experiment because it liberates the gas more slowly, thus eliminating the danger of blowing out the stopper or bursting the bottle.) A rubber tube connects a glass nozzle to the free end of the

bent tube. Adjust the stirring rod so that the open top of the vial containing the acid is above the level of the bicarbonate solution.

To put the extinguisher into action, push the stirring rod down until the vial is submerged. If the gas is not given off fast enough to force the liquid up the bent glass tube and out the nozzle, tilt the milk bottle a little so that the acid will run out of the vial. It is better not to invert the bottle completely, however. [Turn the page.]



Blow into a weak alkaline solution and carbon dioxide from your breath joins the water, forming carbonic acid that neutralizes the solution. Drive out the CO_2 , and the alkalinity is restored.

The heaviness and fire-extinguishing ability of carbon dioxide can be demonstrated by leading the gas into the bottom of a large jar containing several small lighted candles supported so that the flames are at different heights. As the gas pours into the jar and gradually fills it toward the top, the candles go out one by one, beginning with the one closest to the bottom.

Every time your wife or mother bakes, the bread or cake itself is a generator of carbon dioxide. The yeast put into bread contains an enzyme which acts upon the sugar and starch in the dough, producing tiny bubbles of carbon dioxide. Heat expands these bubbles, making the bread light and porous.

Baking powder, generally used to give the same sort of lightness to cake, consists of sodium bicarbonate mixed with some solid acidic substance, such as potassium bitartrate (cream of tartar) or sodium potassium

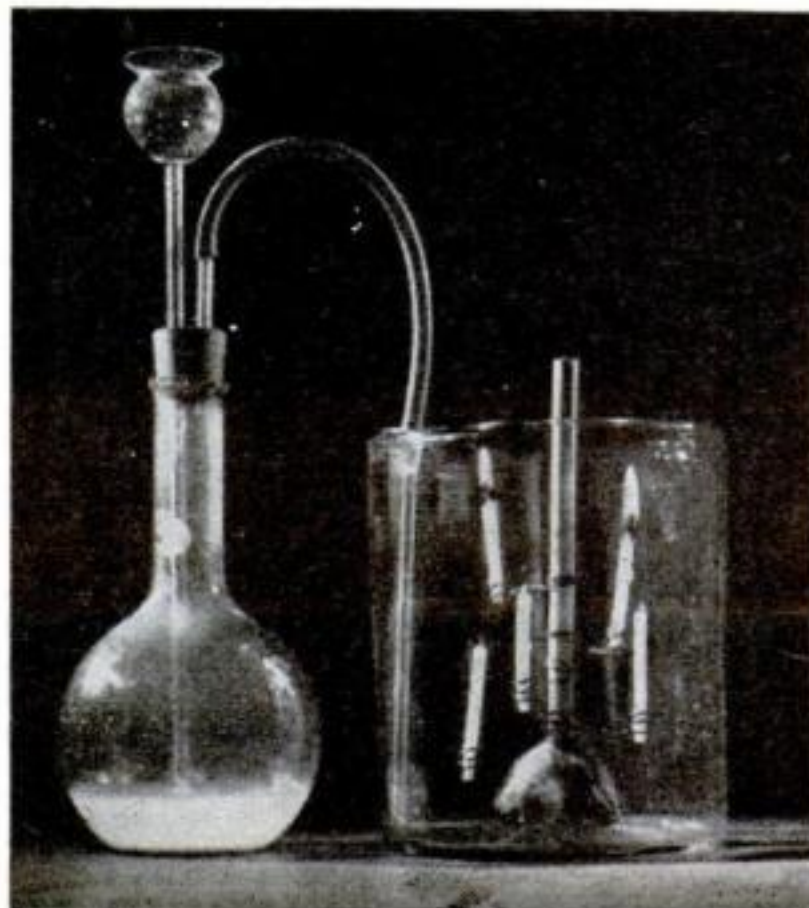
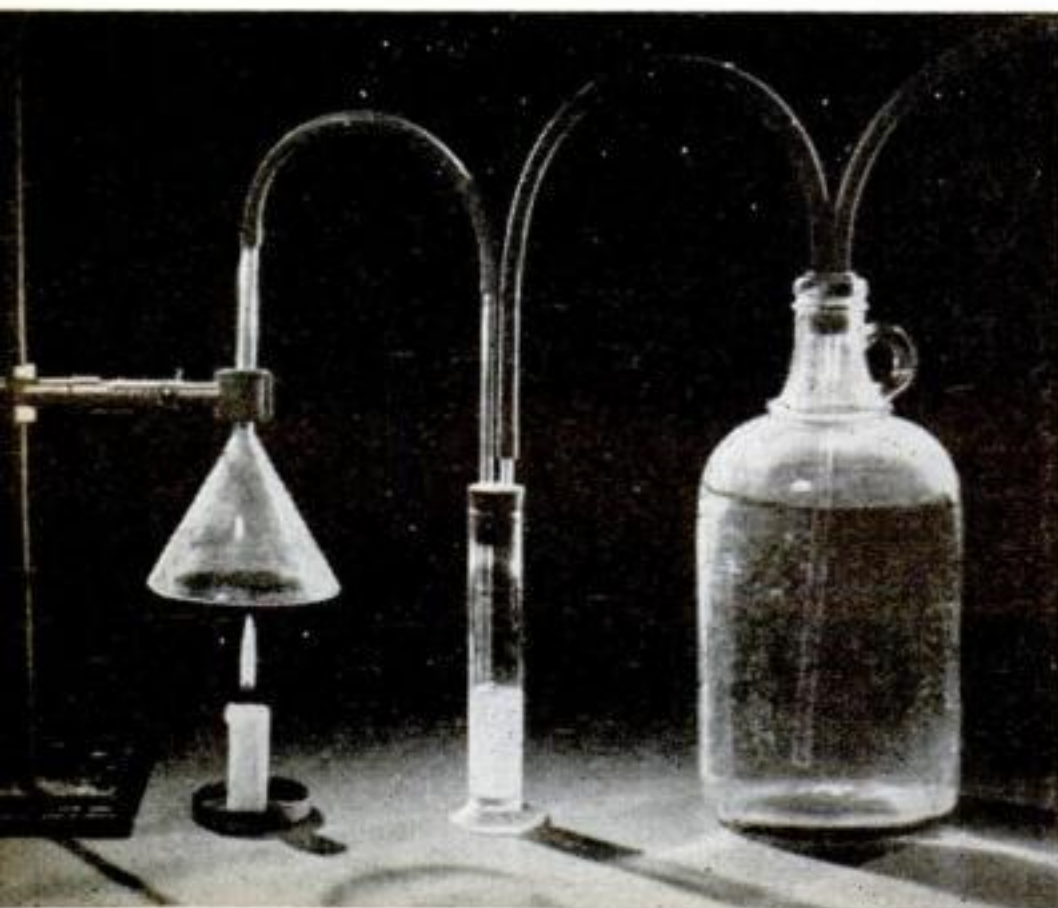
tartrate (Rochelle salts). When the baking powder comes into contact with moisture these substances react because their ions are freed by the presence of water.

You can demonstrate vividly the carbon dioxide generating ability of baking powder by putting a little in a tumbler and stirring with it warm water in which has been dissolved a trace of gelatin. Bubbles of carbon dioxide form rapidly and heap themselves up in the glass. The gelatin strengthens the bubbles, making them last much longer than they ordinarily would.

Similar blankets of carbon dioxide foam, produced by the reaction of alum and bicarbonate of soda and stabilized by gelatin or licorice, are an extremely effective fire extinguishing material. Such foam is used particularly in fighting oil fires.

When dissolved in water, carbon dioxide forms the weak and unstable acid, carbonic acid. You can prove that this acid is real, however, by neutralizing an alkaline solution merely by blowing into it. Dissolve a bit of lye or sodium carbonate in a test tube one-third full of water and add a drop of phenolphthalein solution. The solution will turn a bright pink, indicating an alkali. Now bubble your breath through the solution. The pink becomes lighter and finally disappears. That the CO_2 is only weakly tied up in the neutral salt, sodium bicarbonate, can now be proved by heating the solution. When the carbon dioxide is driven off, the pink color returns.

Generation of CO_2 when substances containing carbon burn is shown by the set-up at left. The siphon draws the gas, produced by the candle, through the cylinder containing limewater, which turns milky when insoluble calcium carbonate forms. At right, candles go out one by one as the CO_2 level rises in the jar.



"Tin Cans" Dish It Out

(Continued from page 134)

sponds to the order "Stand by to fire" by turning a training wheel, keeping the tubes in line with a red arrow. Above him in the fire-control tower, the torpedo officer plots the relative speed and course of the enemy ship and his own. Then he presses a firing key, and the torpedo leaps from its tube. It has been preset to travel at a depth that will do the most damage to its target—which might be five to 10 feet for another destroyer, or at least 20 feet for a battleship or aircraft carrier. On striking the sea, it automatically submerges to this level, and gyro-controlled rudders hold it on an absolutely straight course up to 6,000 yards, driven by its compressed-air motor and tiny twin propellers.

Early in the war, a division of U. S. destroyers, with one lone torpedo left among the four vessels, had the disconcerting experience of meeting a Japanese cruiser and its destroyer escort in the Java Sea. Instead of being able to attack, the American force was in danger of being sunk, if the Japs guessed its plight. So its commander ordered impulse charges to be fired in empty tubes, giving the same flash that the enemy would see if they were on the receiving end of real torpedoes. The bluff worked, and the ships of the Emperor turned tail.

Ask a veteran destroyer commander when he has come closest to death, as the writer once did, and he replies with a grin, "All the time." Odd jobs that destroyers perform often are as perilous as fighting. The U. S. S. *Maury*, whose battle log reads like a history of Pacific warfare, served as a tugboat in the midst of the last Japanese naval attempt to reinforce the Nips on Guadalcanal. Taking the disabled cruiser *New Orleans* in tow, the *Maury* brought her to safe waters through hostile fire and, because of reduced speed, imminent risk of submarine attack.

When waterlogged survivors from sunken warcraft are fished from the sea, destroyers usually are the rescue ships. A tin can is anything but spacious, yet the *Fletcher*—normal complement about 250—somehow managed to take aboard 700 officers and men from the sinking U. S. cruiser *Northampton* during the series of Solomon Island sea engagements.

When strategists set forth to show that every war weapon meets its match in a counterweapon, their favorite example is the torpedo boat versus the destroyer. Away back in 1860, admirals of the world's great naval powers were scared stiff by the invention of the Whitehead self-propelled tor-

pedo. Their peace of mind was by no means restored when Britain, in 1877, built the first torpedo boat to use the new weapon effectively. The steam-driven, 85-foot H.M.S. *Lightning* attained what was then the high speed of 19 knots, and carried a torpedo tube in its bow. Other countries adopted the innovation, and by 1890 the U. S. Navy possessed the 139-foot, 22½-knot torpedo boat *Cushing*, regarded as the top ship of her class.

What good were mighty armor-clads, long-time rulers of the seas, when craft of such insignificant size could sink them? Fuel was poured on the controversy when, during the Chilean civil war of 1891, a cruiser was sunk by a Whitehead torpedo.

The man with the answer was Sir William White, chief constructor of the British Navy. He proposed to build ships similar to torpedo boats but enough faster and more heavily armed to sink them. The result was the world's first torpedo-boat destroyer, H.M.S. *Havock*, a 180-footer of nearly 27 knots, armed with one 12-pounder, three quick-firing six-pounders, and three torpedo tubes. An immediate success, the ship was followed by the first U. S. torpedo-boat destroyer, the 210-foot, 273-ton U.S.S. *Farragut*, which attained more than 30 knots—a record speed for reciprocating engines.

From the turn of the century on, engineering improvements came in rapid succession, and destroyers—having lost their longer name as they became major warships—gained in size and power. Our *Truxton* class of 1900 were 435-tonners. By 1909 our *Flusser* class, first American turbine-driven destroyers, and first to mount three-inch guns, displaced 700 tons. The first U. S. oil-burning destroyers, the *Conyngham* class of 1915, tipped the scales at 1,050 tons.

First to follow World War I, a new *Farragut* class of 1934-5 consists of 1,400-tonners, 334 feet long, armed with five 5-inch and four 40-mm. guns. Our last prewar destroyers, the 1,600-ton *Benson* class of 1940-1 now are supplemented by the 1,700-ton *Bristols*, the 2,100-ton *Fletchers*, and the 2,200-ton *Sumners*.

Formerly, the limited cruising range of destroyers held back all the rest of the fleet. How we are currently able to pound at the gates of Tokyo can now be told. One means has been the fuel-saving use of high-temperature, high-pressure steam, first introduced in the U. S. Navy by destroyers of the *Mahan* class between 1936 and 1940. But perhaps the most important innovation is that of seagoing supply and repair bases.

Jungle Poison Saves Lives

(Continued from page 126)

Experts examined him from head to foot without finding anything wrong. Yet Gill lay in a hospital bed in Washington, D. C., unable to move and almost devoid of a sense of feeling. The doctors' best guess was that he was a victim of a type of spastic paralysis.

Persons afflicted with this ailment were sometimes shaken by muscular tremors and sometimes drawn into contorted postures by the tense rigidity of their muscles. Gill's doctor told him there was no known remedy for it, although a few promising experiments had been reported with an outlandish jungle poison, called curare. . . .

The name electrified the explorer. Suddenly, he felt that he had to get well and return to the tropics. From the Indians there, he might obtain enough curare so that these experiments could be continued and extended.

To learn to use his muscles again, he buttoned buttons by the hour and took other exercises recommended by his doctor. In a few months, he was able to leave the hospital. But four years passed before he was able to go back to Ecuador. Then he went as head of the Gill-Merrill Expedition.

Gill feared the witch doctors might have forgotten him, but they welcomed him heartily. With their help, he brewed curare; and with a fleet of a dozen cargo-carrying canoes he was able to transport it down the perilous rapids. After 10 strenuous months, he came home with the largest supply of curare ever brought out.

Gill also brought home motion pictures and still pictures showing every detail of the mumbo-jumbo manufacturing processes used by the Indians. For fully a century, commercial curare had been considered "a most unreliable drug." But the Gill-Merrill Expedition enabled scientists to standardize it—that is, produce a pure preparation with a known and definite potency and consistency, so that its effect on a patient could be foreseen accurately.

This was done first by Dr. A. R. McIntyre of the University of Nebraska. Independently, with 100 pounds of crude curare supplied by Gill, the drug was also standardized in the laboratories of E. R. Squibb and Sons. This company sent free samples to research workers throughout the country, and has since placed curare on the market under a trade name. Gill expects an additional product to be released soon.

In the meanwhile, the medical profession had been confronted by the necessity of making an extremely painful decision. Con-

vulsive-shock therapy had been developed as a means of curing certain mental ailments. Remarkable cures had been brought about. But the patients' convulsions were sometimes so severe that they injured themselves internally and even broke their own bones. Mental illnesses were being conquered at the risk of serious physical injury. Should such treatments be continued?

This grim controversy evaporated when curare was standardized—for this drug made it possible to continue convulsive-shock therapy without the grave danger of physical injuries.

Dr. A. E. Bennett of Omaha, Neb., was one of the pioneer users of the new drug. He employed it first in treating children with spastic paralysis. It did not prove to be a permanent cure, but brought about marked improvements.

Tests upon laboratory animals had shown that the drug relaxed muscles by paralyzing or blocking the connection between them and the motor nerves that energize them. Dr. Bennett's successes proved that curare could be used safely in the treatment of human beings.

The Nebraska doctor injected a curare solution into patients about to undergo the dreaded convulsive therapy. The results, to one who had witnessed "uncushioned" shock treatments, were spectacular. With curare as a shock absorber, the patients lay peacefully relaxed during the treatment. Best of all, the mental part of the cure was accomplished with undiminished success.

While curare itself is not an analgesic, or pain-killer, anesthesiologists have found it valuable in conjunction with standard anesthetics. They have used it to relax body muscles and provide conditions suitable for the intricate work of modern surgeons without administering toxic concentrations of the anesthetic. This may be one of its most important uses.

The scientific version of the witch doctors' dope has proved helpful, too, in the diagnosis of an often-fatal disease called myasthenia gravis, which is characterized by drooping eyelids, double vision, muscular fatigue, and nasal, husky speech.

The Indians who were the first to use curare do not employ it in warfare, because there are other ways of killing people. This drug is traditionally a means of helping hunters obtain food. Dr. Bennett calls it "the most powerful perfect muscular relaxant that is known." Now that it has been standardized by scientists, it may be helpful in many more ways.

Why Dice Behave as They Do

(Continued from page 123)

most likely to come up. This is done by trimming the sides slightly. Ordinary, cheap dice are rarely perfect cubes, so an unscrupulous player can take an assortment of store dice and select a pair which, because of their shape, will produce certain numbers more often than others.

The crooks do not expect to make their point every time, nor do they want to. They are well satisfied to have a good percentage in their favor.

The operator of a crap table in a gambling house has no use for crooked dice. He has the advantage in percentage against the guest who throws the dice, and also against those who bet on "the field," which is an important feature of all these tables.

The game of craps came to us from England and France, where it is known as hazard. What the Americans call "snake eyes," the double ace, is called "crabs" over there, and it is believed this is how we got the name of craps. Hazard was an outgrowth of a game played with three dice in ancient Rome and Greece. The Romans had names for the points, as our players do. The highest point was called "Venus" and the lowest "the dog." The Greeks called them "Aphrodite" and "the dog."

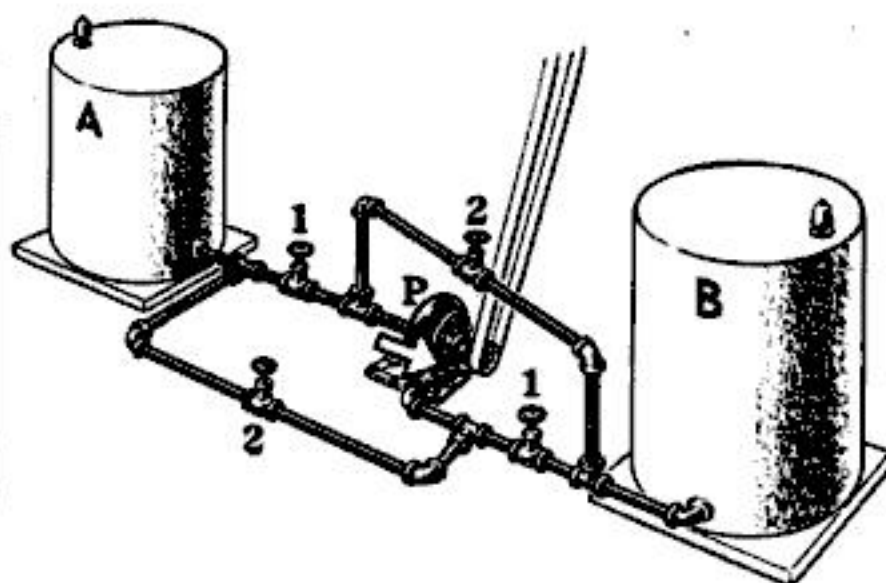
Dice games were played by all ancient peoples. Dice exactly like those with which we play craps have been found in Egyptian tombs. Some were made of ivory, some of baked clay. All down through the centuries, people gambled high stakes on the throw of these cubes. It became such a vice in England that the crown put a prohibitive tax on the sale of them. Strangely enough, this tax was discarded in Queen Victoria's reign.

Countless new games of dice have come and gone while the simple game of craps keeps going strong. This game probably owes its popularity to its simplicity. Anyone can learn the rules in about a minute, but the great majority of players do not take the trouble to figure out the odds.

The game of hazard is now played the same as craps. Formerly, the seven did not occupy the special place it now does in the game. It was a point like the others. The player called his point before he rolled. If he made the number called, he won; if not, the number rolled became his point, and the number he called became the hazard. Because of its mathematical merit, the seven was the number called most often, and in time it became the regular hazard, just as it is today.

SOLUTIONS TO BRAIN TEASERS

(See page 127)



PLUMBING EFFICIENCY

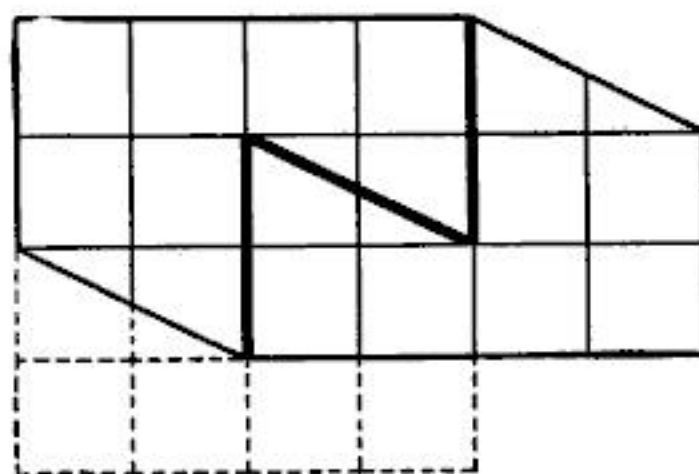
IF THE valves marked 1 are open and the valves marked 2 are closed, the oil will run from left to right. If the valves marked 1 are closed and the valves marked 2 are open, the oil will run from right to left. In either case, the oil always runs through the pump from left to right.

FOR TRIANGLE COUNTERS

1. 13 triangles. 2. 105 triangles.

GRANDMA DID IT EASILY

THIS is how she cut an odd-shaped remnant to piece out a square.



WIRED CUBES

1. Four pieces of wire.
2. One piece of wire. (Following the numbers on the drawing, this would be one solution: 1-5-6-7-8-5-3-7-1-2-6-4-8-2-3-4-1).

UNSCRAMBLING NEW YORK

There are several possible solutions to this. Here is one of them: 3-9; 11-10; 4-11; 1-4; 2-14; 15-1; 5-15; 12-5.

Plane of Many Faces

(Continued from page 105)

sweet job for any man's money." That's what the mechanics think of the Invader.

When you talk to the pilots you hear the same story from another angle.

"She's a lot of ship," one of them says. "She handles easy. Makes you think of a Havoc, in some ways, but she's got more power. Throttle action gets results right now, and I mean *now*. She's bigger, of course, but you can wheel her around like a Havoc, and that's saying something. Lots of climb, lots of speed, lots of maneuverability. And plenty of ceiling—plenty. She

gets away fast and she goes places in a hurry. She can take care of herself, too. Make no mistake about that. As for firepower . . ." He grins and lets it go at that. "You'll hear plenty from this ship, from all theaters. Plenty."

Then you ask the armorer about her, and he looks up at all those guns and hunches his back, as though thinking of all that ammunition. Then he winks slowly, grins, and says, "There's sure a lot of fight in that ship. No matter what nose they put on her, she's a killer. She's one hell of a fighting ship."

Temple of a Thousand Steps *(Continued from page 111)*

The small pyramids, about four feet high, at the top of the stairs, also may have been places to seek protection and stage sudden counterattacks. During a siege, ample supplies of water could have been drawn from the lake, Agua Azul.

Along the lower end of the lake basin, in front of the lower platform, there is an obstruction, or dam, composed of heavy stone rubble which probably was surfaced originally with cut limestone. It held the water in the basin above it, making that basin, in effect, a huge moat. The dam was wide enough to have been used as a causeway. Near the base of the temple there is a spillway, which still operates after a heavy rain. In the clear stream near by, other submerged stones have been found which may be the remnants of dams, bridge foundations, or retaining walls to channel the river waters. Hence, the Mayans appear to have had some knowledge of water engineering.

Behind the small pyramids on the upper platform, at the foot of the final flight of steps, there is an upright stone idol, now broken into four parts. This tablet, or stele, bears somewhat shattered hieroglyphs which, if Mayan custom was followed, indicate the approximate date the temple was completed. These markings have not been read with certainty, but authorities believe that the date on this stone falls within the first half of the fifth century.

From the high altar above and behind this idol, one can see, to the west, the large and exquisitely blue Lake Tepancoapan lapping the base of a mountain range. To the east, at least eight more blue lakes are visible through the clear, dry air. And, to the south, one sees a plain dotted with other ruins, Indian cornfields, brush, and short pine, rolling away to end at a moun-

tain range across the Guatemalan border.

The sky is startlingly blue, the clouds piled against it even more startlingly white. The stones and cliffs are white and gray, and the foliage green, brown, and red. Orchids and widow's veil can be seen everywhere and, hundreds of feet below the altar, there is the beautiful, still, blue, cliff-bound lake in whose cliffs were once entombed the remains of the holy men of the Mayans.

Evidence of the engineering skill of the Mayans in heavy stonework is found also in the ruins of Chincultic, across the old lake basin and less than two thirds of a mile from Agua Azul. There, evidence has been found that the Mayans understood the making of terra cotta, and made statues of it.

When Mexico's roads are improved and tourist travel is encouraged again, many Americans may find it fascinating to visit these and other spectacular ruins in this distant valley of the Sierra Madre. In my opinion, the whole idea of the Temple of a Thousand Steps, its orientation and location, presents us with a new conception of temple building which heightens our admiration for the ancient Mayan architects.

Aluminum Cloth Is On the Way

IT WON'T be long now before women's dresses and other articles of clothing, to say nothing of curtains and drapes, will be made of aluminum cloth, according to an announcement by the Aluminum Company of America. Several companies have developed the new fabric, which is made by laminating thin sheets of aluminum foil with an acetate plastic between. The cloth can be produced in all colors. It has unusual qualities for protection against both cold and heat, since it retains body warmth and tends to turn aside radiant heat.

My Sweetheart's a Black Widow *(Continued from page 119)*

of night; when you can climb away from the Tonys, Tojos, and Franks and turn with 'em; when she always brings you home from dangerous lone-wolf intruder missions; and when you know her cannons will knock out of the sky anything that flies and never jam—brother, you've got an airplane that's both safe and deadly. (Not until recent weeks did Black Widows carrying four .50 caliber machine guns in the top turret reach our squadron.)

Only in a plane designed and equipped for the purpose is the specialized and comparatively new operation of night fighting certain of success. The Widow carries in her two engines more than 4,000 horsepower—as much as a Diesel locomotive. Full-span flaps shorten take-off and landing distances, so we can operate from short fields, under fire. Retractable ailerons of the spoiler type shorten the turning radius and give us easy control at high speeds. Elevator booster tabs, unusual on a fighter, make it easier to actuate controls, especially in tight, steep turns. Usually, we need all their aid when winging away to protect a convoy or to stop the Jap before he can blast our own installations with machine guns and bombs.

No telltale tracers stream out from our guns. We make ourselves as inconspicuous as possible. We sneak in, kill, and run. By sneaking and striking, my squadron of 12 planes bagged 14 Jap planes in 11 nights over and near Mindoro, in the Philippines. Four of these, as luck had it, were mine—all shot down in a single night.

We moved from Morotai to Mindoro the day after Christmas to protect a new airstrip and cover invasion convoys moving north to Luzon. Gunfire from a Jap naval task force drove us away that night. I hovered over the Jap ships until long after midnight, keeping up a Clem McCarthy running account so that the B-25's and B-24's of the Fifth Air Force, and day fighters acting as dive bombers, could drop their loads on the best targets. Gas low, I pulled out to land at Valencia, near Ormoc, on Leyte on a grassy strip illuminated briefly by the lights of jeeps parked along the edges.

Early in the morning, I flew on to Tacloban, where I found the rest of my squadron's planes and crews safe. After refueling, we returned to Mindoro to take over night patrols and night convoy cover. At dusk and dawn, four-plane flights patrolled in regular fighter formation off the fringes of the convoys. Two patrols protected our base. After darkness fell, single plane flights

covered the convoys. Even in the moonlight, the hundreds of ships seemed to stretch beyond the horizons, a mighty portent of trouble brewing for the Japs on Luzon. We really pushed 'em those nights. The squadron's planes averaged 10 hours in the air. We flew halfway around the world every night.

With more than 100 night missions behind me, I long ago had overcome my dread of lack of vision. You don't fly these killers by the seat of your pants. You trust to your many instruments. I placed utmost confidence in both the plane and the instruments. You've got to trust 'em when the radio's silent, and you're up there in a void weaving around the sky three and four hours. It's a monotonous, lonely job—but fairly safe if you keep a cool head. The job, as the British say, calls for "dash with discretion."

Theoretically, you never shoot down an enemy plane by instruments alone. You need visual contact. On a bright, moonlit night, I found I could see a Jap plane a half mile away. When clouds or storm obscured the moon, I've sneaked up within 200 feet of a twin-engine bomber without being sure whether he was friend or foe. If he didn't reply with the proper code to our signal, it was "Katy bar the gate." Something awful would happen.

Business proceeded as usual until the night of January 7. That's when the cannons of my "Time's-A-Wastin'" got four—two Irving bombers, a float recon plane, and a Frank.

Three of us took off shortly before dusk and flew 50 miles south to cover a convoy of 300 ships. Thirty minutes after the light began to fade, I sent my two wing planes back, and continued my patrol alone. It was perhaps an hour later when the fighter director ship messaged: "Indications plane coming from southwest—8,000 feet—12 to 15 miles away."

I set a collision course, climbing and hoping to intercept the Jap at a safe distance from the convoy. I closed in fast, and first saw him two miles away, scudding toward a cloud. Both Phil and I identified him instantly: An Irving, similar to a Nick, only slightly larger. A deadly 20-mm. stinger in the tail, and three 12.9-mm. machine guns. Mustn't let him get in the first burst.

For seven minutes I chased the fellow. He turned in and out of the clouds. Gradually we descended. I hit him with a short burst as he entered one patch of cloud, and got away a second burst, the bullets striking

around the wing roots, when he came out in a turn. His tail stinger was chattering, but not for long. Down he dived, burning, to disappear completely.

The Irving was swallowed by the sea at nine o'clock, straight up. We circled only long enough for Phil to confirm the kill. I headed west, climbing to patrol altitude of 8,000 feet, to place myself off the west side of the convoy once more. Within a couple of minutes Phil spotted another one. "About 11 o'clock," he grunted. "Same altitude." I swung the plane a needle's width or so. Then I saw him, another Irving, etched against the moon.

He was so close to the convoy I had no chance to maneuver for a tail shot. I opened her up wide, in a head-on approach, diving to cut off the Irving before he started his bomb run. At 800 feet I cut loose with a three-second burst. Slugs bit into the canopy, others opened his fuel tanks. Several pieces flew off. The plane tumbled 1,500 feet and blazed merrily as it glided into the water.

By now, our gas was dangerously low. We landed to fuel, grab a cup of coffee, and snatch forty winks. The ground crew had no time to rearm the guns, but I figured we had maybe half the 700 rounds we had started with. Shortly before three we rolled off the dark runway to patrol locally. Our plane took the west sector. For a half hour we sat there, 20 miles off the island, "orbiting the beacon" in a 25-mile-long shuttle at "an altitude of expectancy." This meant 7,000, for the Japs had been coming over at 8,000 or lower.

Two in one night was a good score, I was thinking, when ground control broke into my thoughts: "Smith from Barr. Start letting down on course of three zero zero. Level off at three thousand." Minor changes came through rapidly: "Take course three two zero . . . new course zero six zero." The Jap apparently was coming from the north, offshore. Ground control was bringing me toward the coastline for an interception. "Course two seven zero . . . let down to 1,500 feet." Now Phil took over. "Let down," he shouted. "Steady . . . right . . . steady . . . haul off the coal!"

I throttled back. I had overshot. It was like trying to catch a greased pig. I almost had my guns on a Rufe, a single-engine navy float plane. But the Widow was too fast. For five minutes I circled over and around him. We were down to 200 feet. He maneuvered like mad. I'd pick him up, then lose him in a tight circle. I could almost see that pilot mopping his brow when I finally caught him against a light portion of the sky. I let the flaps half down, hoping their drag would cut our speed to 120. He

dived, but didn't seem to go anywhere. Then I let him have a short burst at 150 feet. His grave is unmarked.

Back once more on patrol course, I was certain the night would bring no more excitement. An hour groaned by. We had reached the north end of the course for the umpteenth time when the ground control broke the monotony. Something going north, vector zero two zero. That something, I learned later, had been strafing the base. The horse had been stolen, and it was up to us to lock the door so that particular thief couldn't sneak back another time.

Barr put us on him at 8,000. When Phil got a contact, I dived the Widow to 4,000, picking up speed to catch the fleeing fighter or bomber before he could escape ground control's range. I first saw him in the dusk-before-dawn 4,000 feet ahead and above us. Gradually I approached, directly on his tail. Phil formed a word with his lips: "Frank." Yep, we had a new-type fighter in our sights. I knew the Frank could hit 400 or faster. It's like the Zeke, but better.

Now I began to worry. Three kills already. How many rounds of ammunition had I used? Maybe I had a hundred left, and maybe I had only two or three. I had to get him with the first burst! Phil commenced calling off the ranges. When he hit 150, he peered out ahead. I could see the Frank looming up closer and closer. I closed to 75 feet. At that deadly range . . . Phil says we were closer . . . I hit the button. Twenty, 30, maybe 40 tapered steel slugs rammed into the Frank. As he exploded I chopped the throttle, dropping back to avoid most of the debris.

Dangerous? Foolhardy? Yes, I guess you'd call it that. But I meant to get him, and did. As it turned out, I might have taken a longer chance by firing from a greater distance. My crew chief reported later we had used 380 rounds for the night. I could have poured another 320 slugs into that luckless Jap.

Seven victories do not add up to a large total. That's not the real test of night fighting. Night fighters are primarily a defensive weapon, though they are sometimes used for train-busting and strafing ground installations. Our real job is saving airstrips and convoys from damage in the dark. As I said, few Jap planes have escaped once they blundered within range. That's the finest tribute I can write to the Black Widow. She's my sweetheart.

Subscribers in the armed services who notify us of change of address are requested to give us the key symbols appearing on the wrapper in which the magazine is received.

So you'll eat better



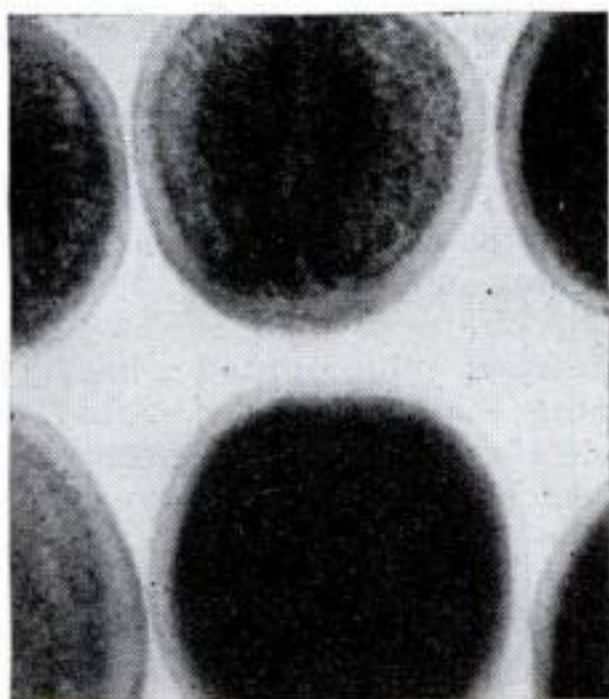
MORE FOOD from farms where electricity is a "hired hand" ... milking cows, pumping water, churning, grinding, increasing egg laying.

Earlier, better crops from electric hotbeds. Stronger, healthier calves ... when treated with ultraviolet. Better oranges ... with an x-ray playing "policeman" to toss out any below-standard orange. Food kept better ... with electric refrigeration. And better cooking ... with all those electric kitchen helpers you treasure.

Of course General Electric isn't really in the food business. But you can hardly find a farm, a factory, or a home where G-E research and engineering haven't helped get things done better. *General Electric Company, Schenectady, N. Y.*



"Floating drugstore" feeds 2,000 sailors. Ice cream aplenty on battle-wagons and most combat ships is now made on equipment recently developed by The Bureau of Ships, Bastian Blessing Company (who built the freezers and cabinets), and General Electric (who built the refrigeration equipment).



Which is the good orange? By inspecting oranges with G-E fluoroscopic units after severe frost, California and Arizona citrus growers salvaged millions of good oranges that would have been condemned by other methods. (The unfrozen orange is the dark one at the bottom of the picture.)

★

Hear the G-E radio programs: *The G-E All-girl Orchestra*, Sun. 10 p.m. EWT, NBC — *The World Today news*, Mon. through Fri 6:45 p.m. EWT, CBS — *The G-E House Party*, Mon. through Fri. 4:00 p.m. EWT, CBS.

FOR VICTORY—BUY AND HOLD VICTORY BONDS



Ultraviolet for calves. Ultraviolet lamps make calves grow faster, healthier. Laying hens and baby chicks are also helped by such G-E lamps. Scientists and engineers at General Electric have devised electrical equipment to do dozens of different farm jobs from corn shelling to soil sterilizing



Vitamin detective. Nutrition expert Dr. Jennie McIntosh works on experiment to determine best way to retain vitamins in cooked foods. This is one important project of General Electric's Consumers Institute. Discoveries are made public, and also are used to improve G-E kitchen appliances.

GENERAL ELECTRIC

JULY, 1945

Buy War Savings Bonds and Stamps regularly.

209



EVER LOOK A FILE

"IN THE TEETH"?

TIME was when a file was simply a "many-toothed implement for abrading the surface or edges of metals and other materials." Today, with Nicholson setting the pace, files are highly specialized. Research and experiment have produced literally *thousands* of kinds, cuts and sizes—each designed for some particular type of material and operation.

Oddly enough, it is in their minuter details—the *teeth*—that files have one of their most important distinctions. Look at the teeth of different files through a microscope or magnifying glass. Height, thickness, spacing, angle, type of edge, relative depth of overcut and upcut—all make for incalculable combinations and characteristics. For instance, in Nicholson patented serrated-tooth construction, used on certain files, the teeth themselves have "little teeth"—to provide successive cutting edges.

"Know your files" is important in the training of a first-class mechanic. The Nicholson book, "*File Philosophy*," will prove helpful... 48 interesting illustrated pages. *Free*.

NICHOLSON FILE CO., 19 Acorn Street, Providence 1, R. I.
(In Canada, Port Hope, Ont.)

NICHOLSON
FILES FOR EVERY
PURPOSE
NICHOLSON
U.S.A.
MADE IN U.S.A.

Jeep with Wings

(Continued from page 96)

went into action on Guam. Under the command of Maj. Gordon W. Heritage, of Washington, D. C., it was based on a CVE, an oil tanker converted into a carrier. The ship lay off Guam for three days while the leathernecks went in over the beaches. Then the planes took off to establish a base at an improvised landing strip on Orote Peninsula.

They had to land on a makeshift runway because air and sea bombardment had pulverized Agana Field, the Jap airstrip. From 3,000 feet away the Japs were lobbing shells from mortars and spraying the area with machine-gun bullets. The airjeep crews slept, when they could, behind bulldozers.

Daily they flew behind the Japs' front lines. Within ten seconds after they took off they were over enemy-held ground. Winging just over the tops of the trees, they helped shorten the Guam campaign by days by directing the fire of 27 batteries of Marine artillery, each with 12 guns.

One pilot caught the glint of sun on steel as he flew low over the jungle. He ordered a concentration of fire. It cost the Japs three big guns, 60 trucks, and 400 officers and men.

In Italy, during the European war, airjeeps were used to lay telephone lines between command posts and forward observation positions in mountainous country that was hard to get to. The airjeep pilots unreel wire as they flew along.

In Burma airjeeps evacuated 400 wounded British and Indian soldiers cut off by the Japs on the Arakan front. From a hastily built landing strip they had to fly nearly 1,000 miles in short hops back to their home base.

In Algiers, an airjeep pilot sighted a herd of gazelles roaming the countryside behind the coastal hills. He organized a hunting party and dropped several of the animals with rifle fire from the air. A retriever in a ground jeep collected the meat. Camp cooks featured "gazelleburgers" on the menu.

One airjeep was credited with downing a Messerschmitt fighter. When the Nazi got on his tail the airjeep pilot flew into a dead-end ravine. Turning in a circle hardly wider than the span of his own wing, the American pilot watched the German, unable to maneuver out of the hole he had bungled into, crash.

For two months airjeeps were used to keep traffic rolling on the congested "Red Ball Express" highway line between Cherbourg and Paris before American engineers

(Continued on page 214)

How a U. S. Warship won a tank battle

It happened during the invasion of Sicily . . .

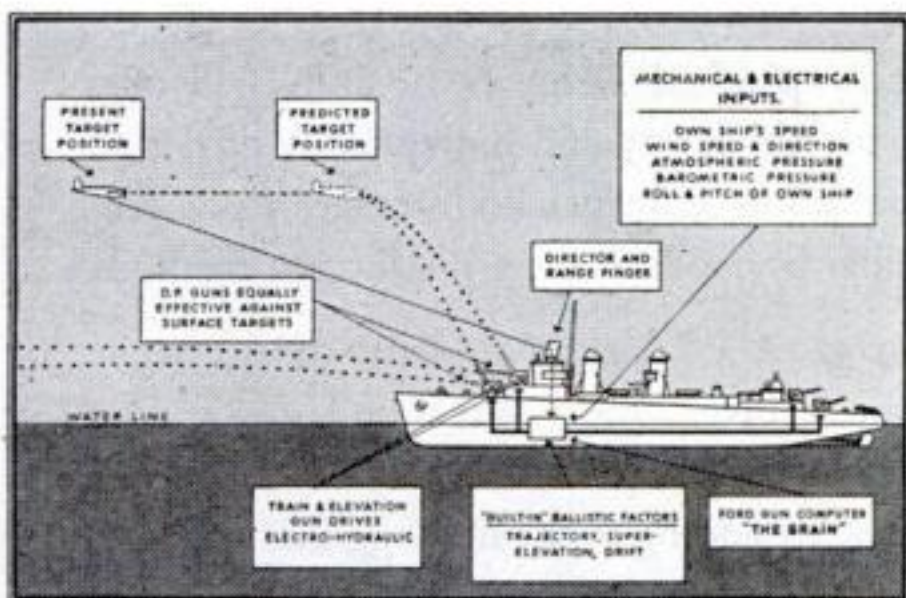
U. S. troops had landed. Before they could get tanks and artillery ashore, Goering's Grenadiers staged a savage tank attack.

Suddenly, five-inch shells began bursting among the surprised Nazis. Tank after tank was picked off with deadly accuracy, and the remaining tanks scurried for cover. Goering's Grenadiers had suffered a sound thrashing.

And somewhere out in the Mediterranean the jubilant gunners of a U. S. destroyer polished up their 5-inch "DP" guns—and decorated their ship's trophy panel with silhouettes of Nazi tanks!

"DP" is the Navy designation for *Dual Purpose*. Those five-inch guns can fire at surface targets, but they are equally deadly anti-aircraft weapons.

The secret of their ability to perform either task with devastating efficiency is the Navy's



How the Ford Gun Computer helps make the Navy's fire-control system equally effective against aircraft and targets on land or sea.

system of fire control, based on a number of precision instruments and controls.

The "Brain" of the system—an incredibly nimble, accurate, and tireless one—is the *Computer*, located far below decks where it is protected by heavy armor plate.



The **Computer** was developed over a period of years by the Ford Instrument Company, a division of Sperry Corporation, working closely with Naval engineers. In use, this device receives a bewildering aggregation of fire-control data from a Rangefinder, a Director, and other precision instruments.

In a split second it automatically solves mathematical problems that would occupy a mathematical wizard for hours. The solution of the problem is transmitted to the ship's batteries through the "brawny arms" of Electric Hydraulic Gun Drives which train and elevate the guns and keep them on the target.

And that is why gunners of the U. S. Navy can lay a string of hot bursting, high-caliber projectiles along the path of an enemy bomber or torpedo plane . . . as well as pick off a tank miles away on shore.

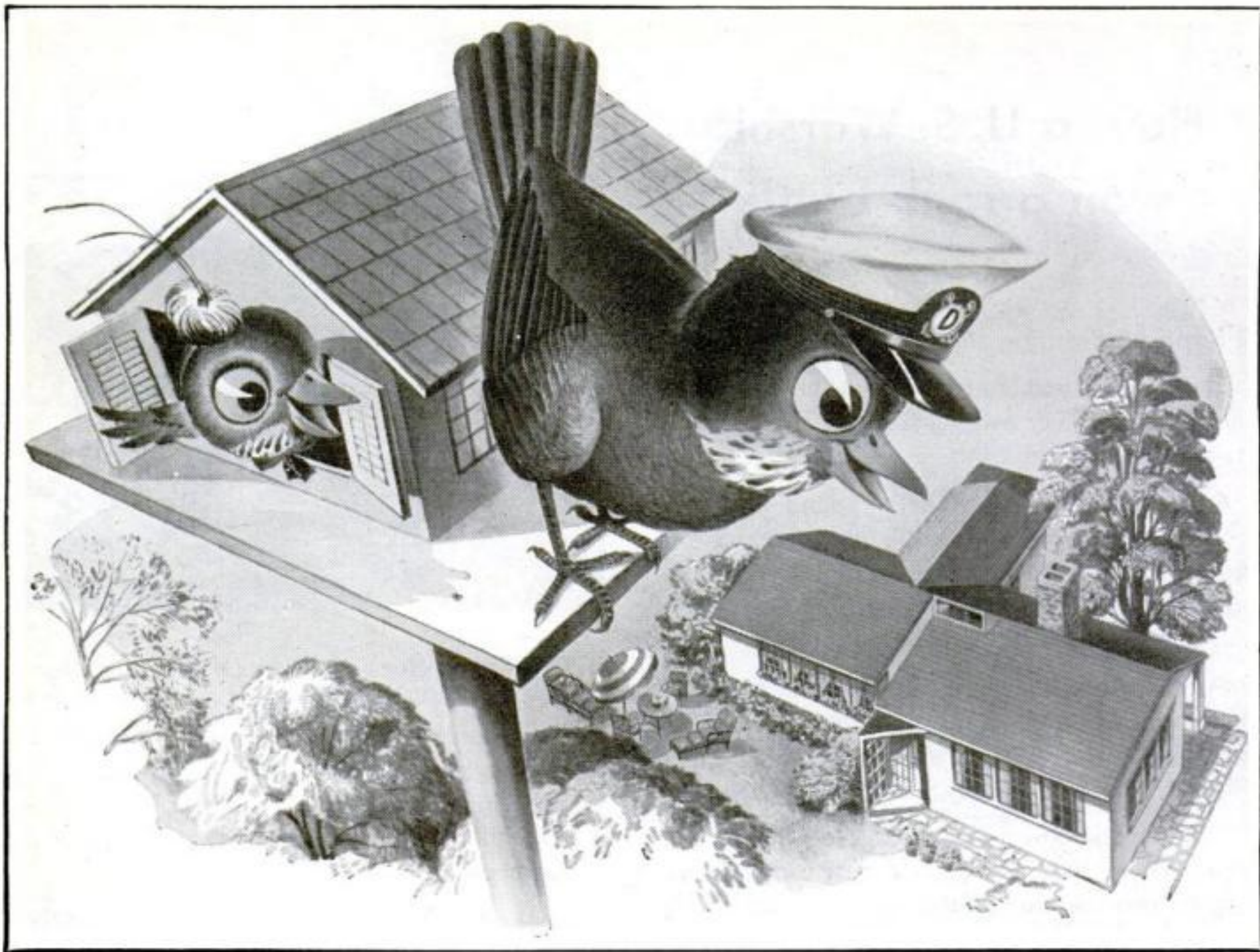
That's why our Navy is the fastest, straightest-shooting Navy in the world!

SPERRY

CORPORATION

30 Rockefeller Plaza, New York 20

FORD INSTRUMENT CO., INC.
SPERRY GYROSCOPE CO., INC.
VICKERS INCORPORATED
Waterbury Tool Division, VICKERS INC.



Bird's Eye View . . .

JUST looking at the outside, as Defoe's little feathered home-builders are, can't possibly convey any idea of the comforts and advantages which are being perfected for your postwar home!

● ● Many new features that will save hours of tiresome housework are among the advancements in functional design, planned by Defoe's Housing Division for homes of tomorrow, large and small. These scientific-

cally planned Defoe home-units will offer not only beauty and individuality of design but also the financial advantages made possible by modern mass production methods.

● ● And remember that today, while you're investing in War Bonds to do your part in winning final Victory . . . you're also steadily adding to the nest-egg that will help to finance your future home, when you're ready to buy or build it!

COPR. 1945 DEFOE SHIPBUILDING CO.

HOUSING DIVISION-DEFOE SHIPBUILDING CO.,

BAY CITY, MICHIGAN

Defoe

BACK THE ATTACK
—BUY WAR BONDS

☆☆☆☆☆ Five White Star Renewal
Citations now decorate the Navy "E"
Award won by Defoe workers.

SHIPS FOR VICTORY
SERVANTS FOR PEACE

**FULL STRENGTH
HORSEPOWER
FOR YOUR CAR**



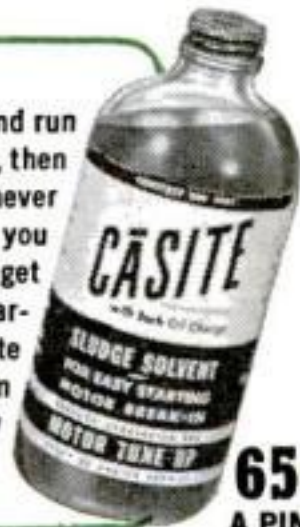
CASITE

**Guarantees better and smoother
performance or double-your-money-back**

CLEANS OUT MOTORS • KEEPS MOTORS CLEAN

Ping . . . Sputter . . . Cough . . . Knock . . .
your motor needs a Casite clean-out. At your
service station, car dealer or garage—a pint
in the crankcase every oil change and a pint
through the air intake every three months.

GUARANTEE—Add Casite to crankcase and run
through air intake according to instructions, then
drive your car 100 miles or for 60 days, whichever
is first. If not convinced that Casite gives you
better and smoother performance, you get
double-your-money-back by filling out guar-
antee certificate and mailing to The Casite
Corporation, Hastings, Michigan. Maximum
refund is \$1.30 per pint, twice the nationally
advertised price of Casite.



LESS WORK!

Because My Floors Stay Lovely Longer!"

Why make yourself extra work doing floors over and over every few days? Use *Self-Polishing Simoniz*. It saves you plenty of work because it's so amazingly tough and wear-resistant. Wears ever so much longer than ordinary polishes, yet nothing ever made your floors look lovelier. Nothing easier to use, either; no rubbing—no polishing—just pour, spread and let dry. In twenty minutes your floor sparkles with the same lasting loveliness that makes Simoniz so perfect for automobiles. Cleaning, too, is worlds easier. A damp cloth whisks up dust and dirt, and your floors shine like new again. Why not enjoy this blessing of lovelier floors with less work? Get *Self-Polishing Simoniz* at grocery, hardware, drug, paint or department stores.

THE SIMONIZ COMPANY
CHICAGO 16, ILL.



SELF-POLISHING

SIMONIZ FOR FLOORS

Jeep with Wings

(Continued from page 210)

got the French railroads into operation. Cruising back and forth above the narrow ribbon of pavement, they radioed word of traffic jams to the engineers charged with keeping trucks moving.

The versatility of these lightplanes was proved anew by Lt. Col. John C. L. Adams, an infantry officer, during the invasion of southern France. Twice he landed behind the German lines in an airjeep to make personal contact with the commanding officers of units that had been cut off.

Occasionally, airjeeps were fitted with bazooka barrels on the under surface of their wings, and the pilots attacked extra-tough enemy gun positions with rockets. A variation of the installation is a small barrel platform on each wing strut. The bazookas are fired with lanyards. One pilot on the European front killed off targets as big as German Tiger tanks (P.S.M., Feb. '45, p. 84).

The Germans, British, and Russians have used their own types of airjeeps in a variety of ways. It was a slow German plane of exceptional performance, called a Storch, that snatched Mussolini from Allied captivity. Both the Germans and the British used lightplanes to land saboteurs.

Red Army lightplanes were used to string parachute flares that guided tanks to weak spots in the German lines during the campaign in the southern Ukraine. The Russians arm their airjeeps. They used them for bombarding German artillery positions.

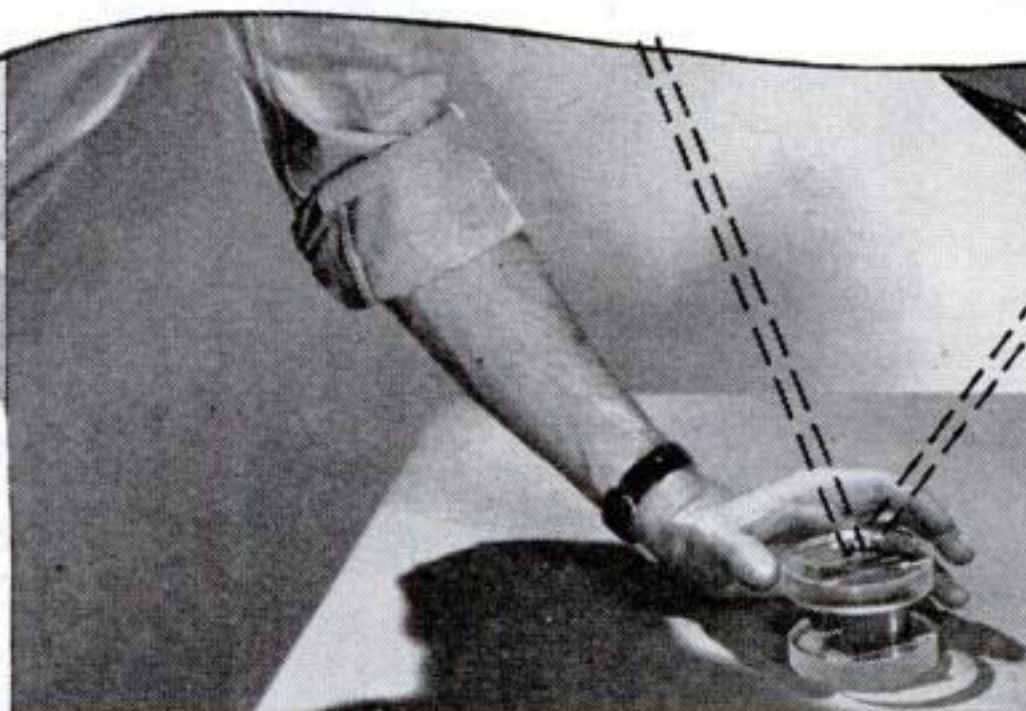
Fast thinking by a grasshopper pilot probably saved the life of Gen. George S. Patton in a close call on the European Front. "Old Blood and Guts" was taking a look at the battlefield from a small liaison plane when a German fighter dived at it with all guns blazing. Patton's pilot dropped the grasshopper to treetop level, and the Nazi, unable to pull out of his dive, crashed in flames.

Airjeep crews are proud of their outfits and their planes, and they sometimes look on the exploits of men who fly bigger, heavier planes with an ironical humor. One squadron in Italy organized a "bombing" mission of eight planes. The ammunition consisted of five-gallon tins of gasoline. Over the target, a German airfield, they solemnly unloaded their "bombs."

Back on their home field they wrote a report: "We failed to shoot down 120 enemy planes. We did not obliterate the target, and, despite flak which was not thick enough to walk on, we did not start fires visible for 80 miles."

Ingenious New Technical Methods

Presented in the hope that they will
prove interesting and useful to you.



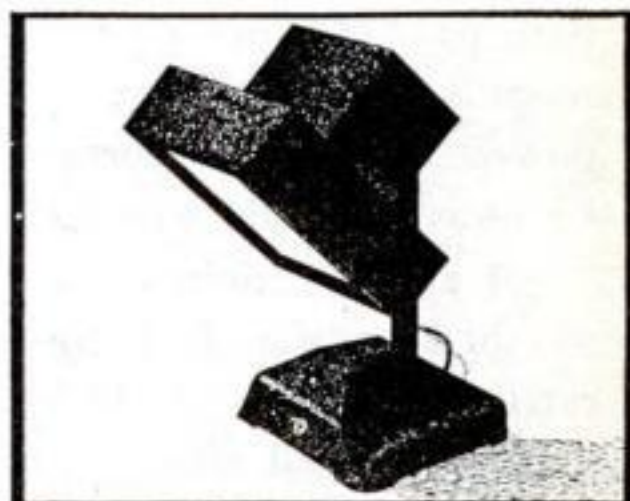
Now! Shop Measurements to One Millionth of an Inch With Simple Light Wave Setup!

The wave length of light is the basis for this amazing new optical measuring equipment—which measures millionths of an inch as easily as a micrometer measures tenths! All that is required, in addition to a simple setup, is average eyesight, intelligence and arithmetic.

As shown above, the work was placed under the Monochromatic Light, upon the work and gauge block—and covered by the optical flat. The light, reflected back to the operator, by the top and bottom surfaces of the optical flat, creates interference bands, representing height intervals of 11.6 millionths of an inch. So that from the center of one dark band to the center of the next, the level of the work has risen or fallen 11.6 millionths of an inch. The bands, simply, are a contour map of the surface. This fact, in a simple mathematical formula, is sufficient to explain all the shop uses of optical flats, and give the work measurement, quickly and accurately.

No longer, however, can your dealer give you Wrigley's Spearmint Gum. Today, under present conditions, this product cannot be manufactured up to Wrigley's quality standards. To protect consumer and dealer alike, the makers of Wrigley's Spearmint have decided to keep the quality Wrigley's Spearmint wrapper empty. Remember this wrapper, it means chewing gum of finest quality and flavor.

You can get complete information from Acme Scientific Division
of Acme Industrial Co., 200 No. Laflin St., Chicago 7, Ill.



The Monochromatic Light.



Optical Flat. Surface of Work.
Interpretation of bands on
truly flat surfaces.

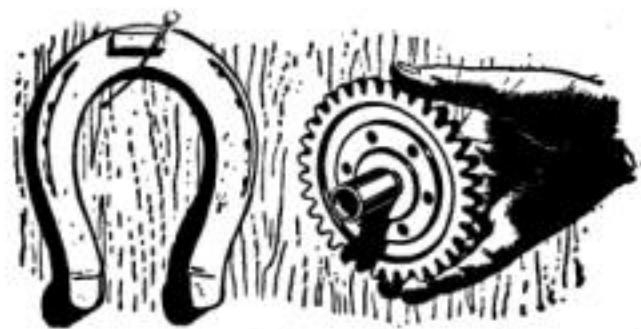
Z-73

Imagine-a **ONE POUND** *Work Horse*



James Watt established the term "horsepower" as the work output of a strong truck horse, weighing perhaps 2,000 pounds or more. A Cyclone 18, roughly equal in weight, is capable of 2,200 horsepower. If the truck horse were as efficient as the Cyclone, he would weigh exactly one pound.

All aircraft engines must have a low ratio of weight to power. If engines are heavy, the loads carried aloft are small. Lighter engines mean larger payloads. Of all aircraft engines, the champion is the Cyclone 9, the only service engine weighing *less* than a pound per horsepower.



POUND OF METAL: A horseshoe and a gear for a Cyclone weigh one pound each. On the horse, this metal is just dead weight, for protection. A Cyclone uses this pound of metal, in high-grade alloy form, to develop the energy of a 2,000-pound horse.



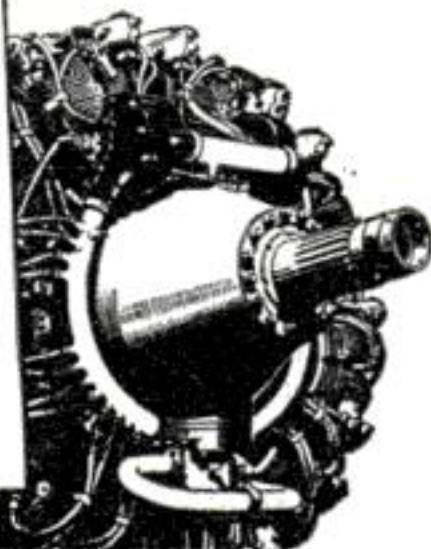
609 HP AUTOMOBILE: The motor of a popular modern car weighs 609 pounds, delivers 90 HP. If it were built to Cyclone design, it would turn up 609 HP for that weight. Most automobile engines weigh from 6 to 10 times as much per horsepower as Cyclones.

SEND FOR "ENGINOLOGY"
only **25¢**

100 pages of Engine Information

Learn more about aviation's source of power. Enginology explains supercharging, combustion and engine principles in non-technical terms; describes their relation to planes and propellers. Just send 25 cents in U.S. coin to:

Wright Aeronautical Corporation
Dept. PS, Paterson 3, New Jersey



WRIGHT
AIRCRAFT ENGINES

DIVISION OF
CURTISS  **WRIGHT**
FIRST IN FLIGHT

CHAMPION

SPARK PLUGS INSURE

DEPENDABLE ELECTRICAL

ENERGY *In the B-29*

Far back in the tail of the mighty Boeing B-29 is an Andover Auxiliary Power Unit equipped with Champion Spark Plugs, for generating electrical energy for the more than 140 electric motors which perform a great multiplicity of vital functions in this ship. On a combat mission this is what the power from this engine does: It starts the main engines . . . changes the propeller pitch . . . raises and lowers the giant dual wheels and landing gear . . . opens and closes bomb bay doors . . . operates the flaps and brakes which slip out of the airfoil . . . runs the bomb sights . . . releases the bombs . . . turns the gun turrets . . . computes the gunner's sighting . . . fires the guns . . . and detects ground units . . . plus providing light and heat for the crews . . . and power for radio and intercom phones. Dependable Champion Spark Plugs here, as in hundreds of other vital war-time assignments, are adding new prestige to their reputation for better performance and greater dependability, in every engine. Champion Spark Plug Company, Toledo 1, Ohio.



Andover Auxiliary Power Unit as used in the B-29. Built by Andover Motors Corporation, and the Ranger Aircraft Engine Division of the Fairchild Engine and Airplane Corporation.

**TO SAVE
GASOLINE
—KEEP SPARK
PLUGS CLEAN**

DUST INVITES GERMS



Ordinary dust raised in sweeping carries myriads of germs which can remain virulent for weeks and even months. That is one reason why thousands of factories, shops, stores, and schools are adopting "Dustless" sweeping. Daily sweeping with a Dustless brush and Arbitrin sweeping fluid reduces bacteria in the air as much as 97%. You ought to know all about this better method of sweeping. Write for complete facts today.



- Dustless
- Speed Sweep
- Speed Wash brushes

MILWAUKEE DUSTLESS BRUSH COMPANY

528 N. 22nd Street • Milwaukee 3, Wisconsin

Prison-Camp Ingenuity

(Continued from page 67)

ting needles out of bucket handles, then knit scarfs, sweaters, and gloves, to have something to swap. One man made himself a tin suitcase, and another built a toy steamboat that ran on a spoonful of margarine.

Desperate amusement seekers made kites out of toilet paper, until the Germans declared this sport *verboten*. Then, lying in his bed one day, Major Orris saw a fly come in his window with a glider in tow. It was a tiny piece of paper, folded the way school-boys fold sheets into toy airplanes, and attached to the fly by a thread. From then on, the imprisoned airmen had glider contests with the flies as tow planes.

During his year in Hitlerland, Orris saw only two movies. One was from Hollywood, "The Male Animal," and the other a propaganda film about the beautiful scenery in Germany. "You can imagine how we felt about *that*," he grins. But the kriegies made a curtain by sewing blankets together and put on stage shows for themselves. A loud-speaker blared German broadcasts at them, and they published two camp newspapers, lettering them by hand and posting them on the wall.

At Christmas, the kriegies scraped wax from the paper wrapped around food and made candles. Major Orris thinned the paint from a box of children's water colors and decorated his window. Soon, nearly all the windows in the camp were gaily painted, but the prisoners got no "bash" (extra big meal) on the holiday.

By January, they could hear the guns on the Eastern Front. The camp was near the Oder, and the Russians were coming that way. On an hour's notice, in the middle of the night, the kriegies were marched out into a snowstorm, with the temperature 10 below zero.

All the rest of the night, led by a horse and wagon, they marched three abreast in a column more than a mile long. Trails of blood were left by the bleeding feet of the horses and the guards' dogs. When a plane swooped low as though about to strafe the marchers, some men dived toward the woods, and the guards opened fire on them. Stragglers, whether guards or prisoners, were just left behind. One guard carried his police dog in his arms for warmth; other guards fell in the snow.

Polish women enslaved by the Nazis looked out of a factory window that dawn and wept when they saw the bedraggled, motley line of prisoners tramping down a

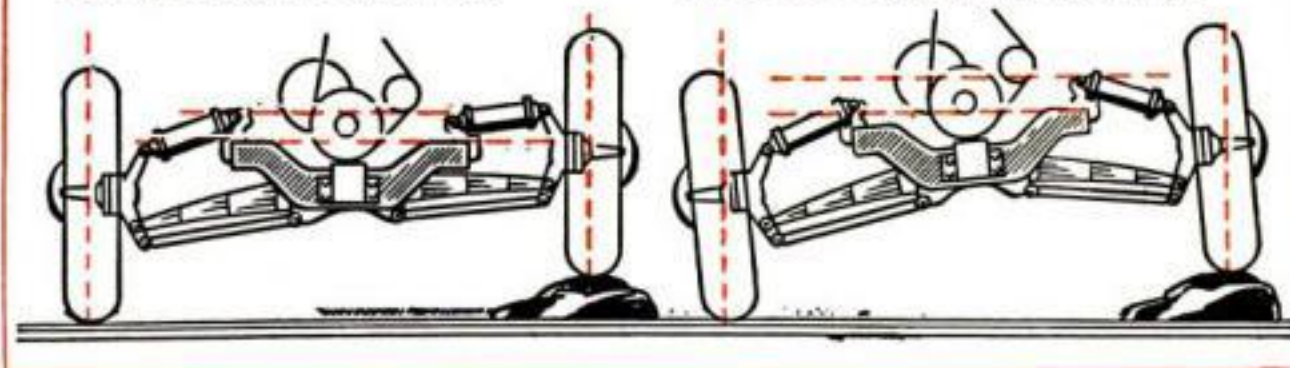
(Continued on page 222)

LIFE SPAN OF LUBRICANT VITAL in making your car "feel" better

Chassis lubricant can rapidly grow old on the job. Time and the effects of oxidation can gum it up or dry it out to the point where it's useless as a lubricant. Then your car no longer rides smoothly — a sure sign of the onset of wear. And no wonder! Here's what happens:

Proper lubrication permits independent vertical motion of wheel riding a road irregularity.

Improper lubrication tends to bind shackles, causing wheel and chassis to move vertically as a unit.



You can avoid the danger of prematurely worn bearings by having your car chassis lubricated with Marfak because this Texaco

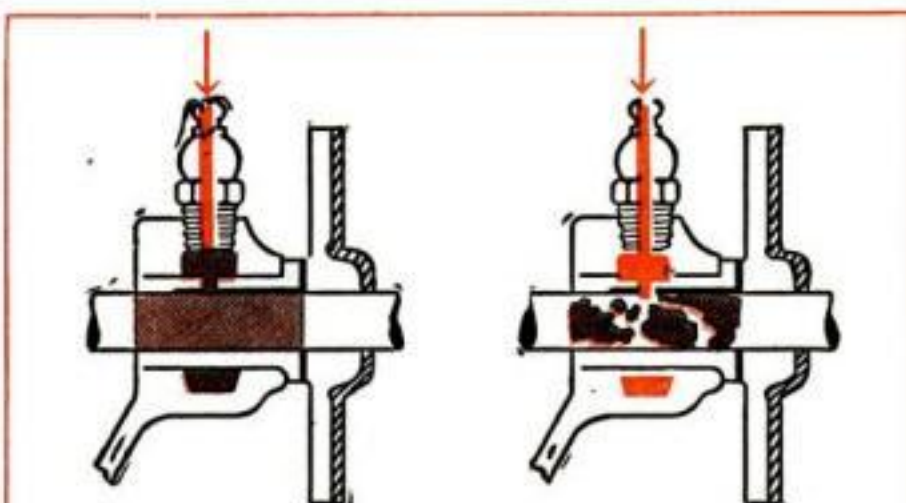
lubricant has an exceptionally long life span.

The drying of lubricants also results in clogged bearings that resist the injection of fresh lubricant, or bearings that remain partially caked with dried-out lubricant, as illustrated at the left.

However, Marfak chassis lubricant is scientifically designed to remain fresh over long periods, to resist oxidation, and to stick to the job. You can *feel* its cushioning effect as you drive — assurance that your car chassis is protected against wear. Marfak is both cohesive and adhesive; that is, it clings to bearing surfaces and, in addition, resists any tendency to wash out, jar out or squeeze out.

Protect and economize by changing to Marfak today! It will help keep your car on the road!

THE TEXAS COMPANY



A clogged bearing can not take in fresh lubricant. Unless it is cleared, the bearing will bind and eventually freeze.

Dried-out lubricant caked on portions of a bearing will cause uneven wear, chattering and eventual destruction of the bearing.



Don't miss the **TEXACO STAR THEATRE** on Sunday nights with **JAMES MELTON** and famous guest stars. See your newspaper for time and station.

You're welcome at **TEXACO DEALERS**

Let us
MARFAK
your car





Enjoy Life with

Miller's

HIGH LIFE



MILLER BREWING COMPANY • MILWAUKEE, WISCONSIN

220

Buy War Savings Bonds and Stamps regularly.

POPULAR SCIENCE

BIRMINGHAM, ALA.
Mean Average Temperature 53.8
During Heating Season

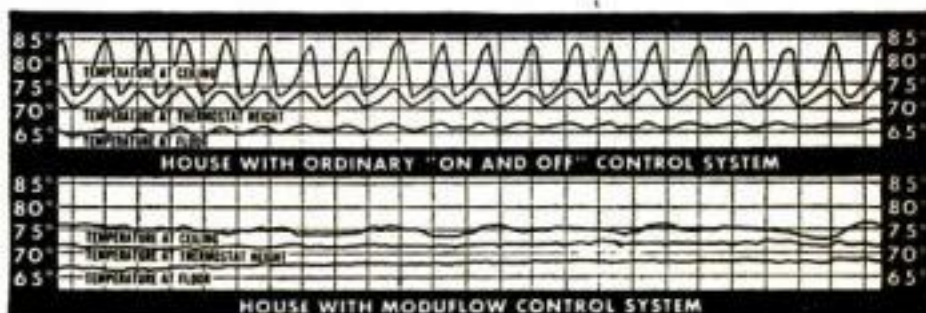


IS YOUR CEILING 750 miles FROM YOUR FLOOR?

Believe it or not, there is probably greater difference between the temperature at the ceiling and floor of your house than there is between the average temperature of Chicago and Birmingham, Alabama — 750 miles farther South. For, in the average home or apartment, the temperature at the ceiling is often twenty degrees warmer than at the floor. (See chart below.) Unfortunately, the heat that rises to the ceiling is largely wasted, while the floor may be drafty and too cold for comfort or health.

But, Minneapolis-Honeywell has devised a remarkable new heating control system that will correct this situation. It is called MODUFLOW. By an ingenious method of heat control and supply, Moduflow nearly equalizes floor and ceiling temperatures; result, uniformly comfortable temperature from ceiling to floor.

Every home or apartment, however modest, can afford the greater comfort and efficiency of Moduflow. Mail the coupon today for free booklet that tells all about Moduflow.



See the difference — Shown above are actual temperature recordings taken in two identical test houses — one with and one without Moduflow. Without Moduflow, temperature varies as much as 20 degrees from floor to ceiling. Note how MODUFLOW smooths out the ups and downs of the ordinary system.

MODUFLOW

The New HONEYWELL Heating Control System

Free! SEND FOR THIS BOOKLET

Minneapolis-Honeywell Regulator Co.
2912 Fourth Avenue South
Minneapolis 8, Minnesota

Please send my free copy of "Heating and Air Conditioning the Postwar Home"

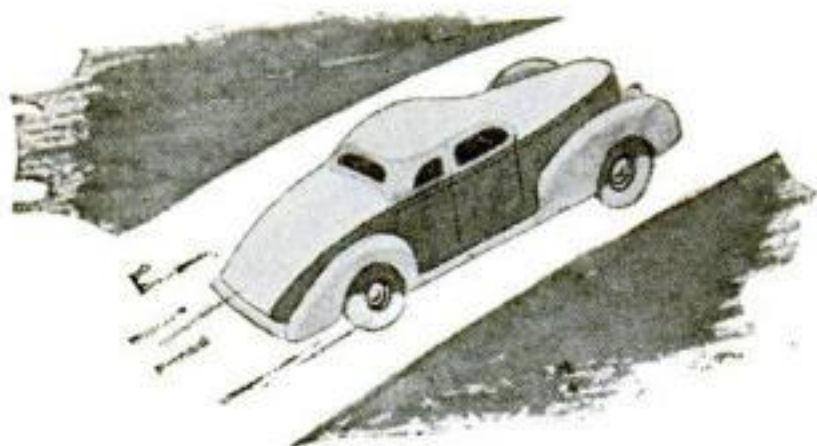
Name _____
Address _____
City _____ State _____

Keep them Winning — Buy MORE Bonds!



CHICAGO, ILLINOIS
Mean Average Temperature 36.4
During Heating Season

CLEAN ENGINES



LAST LONGER



Smooth running, long lasting power requires a clean engine—an engine free of sludge, gum and acid which accumulate in the lubricating system and cause the motor to become sluggish and unresponsive. These petroleum residues are a major factor in destroying engines.

LOOSITE and **SILOO**, swift-working solvents of petroleum residues act quickly and safely to eliminate sludge, gum and acid. **LOOSITE** cleans out the engine—then **SILOO** added to fresh crankcase oil keeps it clean. A simple, harmless, economical method of obtaining maximum performance and longer life from your car.

Preservation of today's irreplaceable motors is vital—so ask your garage, service station or auto dealer for the **LOOSITE** and **SILOO** treatment—then notice the way your engine responds. Your car will run better and last longer.

If you heat with oil — write for information on **SILOO FUEL OIL TANK SOLVENT**.

PETROLEUM SOLVENTS CORPORATION
331 Madison Avenue, New York 17, N. Y.

Prison-Camp Ingenuity

(Continued from page 218)

side road. The men were billeted that day in a barren, dusty room over a pottery works; other days they slept in barns, and once on a woodpile. The snow turned to rain, and the crude sleds on which some of them dragged their packs had to be discarded.

Many had fatigue visions of rosy sunsets, fireworks in the sky, and beautiful green pastures. Eventually they were herded into cattle cars. The 50 men in the car with Orris found they could all lie down at once if they carefully knit their bodies together, and they jolted on across Germany to Nuremberg.

There the weary, underfed, sick, and dirty men were soon covered with vermin and bites, because the cells into which they were dumped had not been cleaned. They received fewer Red Cross parcels, and the soup was often full of weevils. "The more weevils we got," says the Major, "the better we liked it. That was our meat ration." Some of the men became so weak they seldom left their bunks. "They blacked out," Orris explains, "if they stood up quickly."

American planes bombed the big railroad yards just beyond the prison fence. At Sagan, some men had been shot for rushing out and showing enthusiasm during air raids. But here they were allowed to sit on the sandbags and watch the fireworks while the guards ducked into slit trenches.

Major Orris and another kriegie escaped while being marched out of this camp, fled to the woods, built themselves a lean-to, and waited. They were afraid they'd be caught if they moved on—and Patch was coming toward them.

For two weeks they waited, listening to the guns, and living on scraps of food left by German troops who camped near by. They found other escaped prisoners in the woods, and played bridge two evenings with a couple of Englishmen. But the days seemed endless, so they risked moving on toward the northwest—and almost ran into a tank concealed in the brush.

Neither of them had ever seen that kind of a tank, so they supposed it was German and backed away fast. But when they peeked out farther on at an autobahn, they saw a long column of such tanks rumbling toward them—and the faces beneath the helmets of the men on the first tank were black.

"We just about cried," says the Major, "because when we saw that they were Negroes, we knew we were free."



Quiet

Quiet in fractional H. P. motors means minimum vibration. *Quiet* indicates to the engineer precision dynamic balance, rigid adherence to close tolerances, modern manufacturing methods and equipment.

These factors, plus suitable mechanical and electrical design, characterize BALLENTINE MOTORS.

BALLENTINE MOTORS are made in ratings from 1/1000 to 1/6 H. P. for various applications. If you require a *quiet* motor—engineered for long life—built for *your* application, consult Russell—exclusive manufacturers of BALLENTINE MOTORS. Write for descriptive bulletin.



BALLENTINE



MOTORS

RUSSELL ELECTRIC CO.
358 W. Huron Street, Chicago, Ill.
MANUFACTURERS OF

BALLENTINE MOTORS

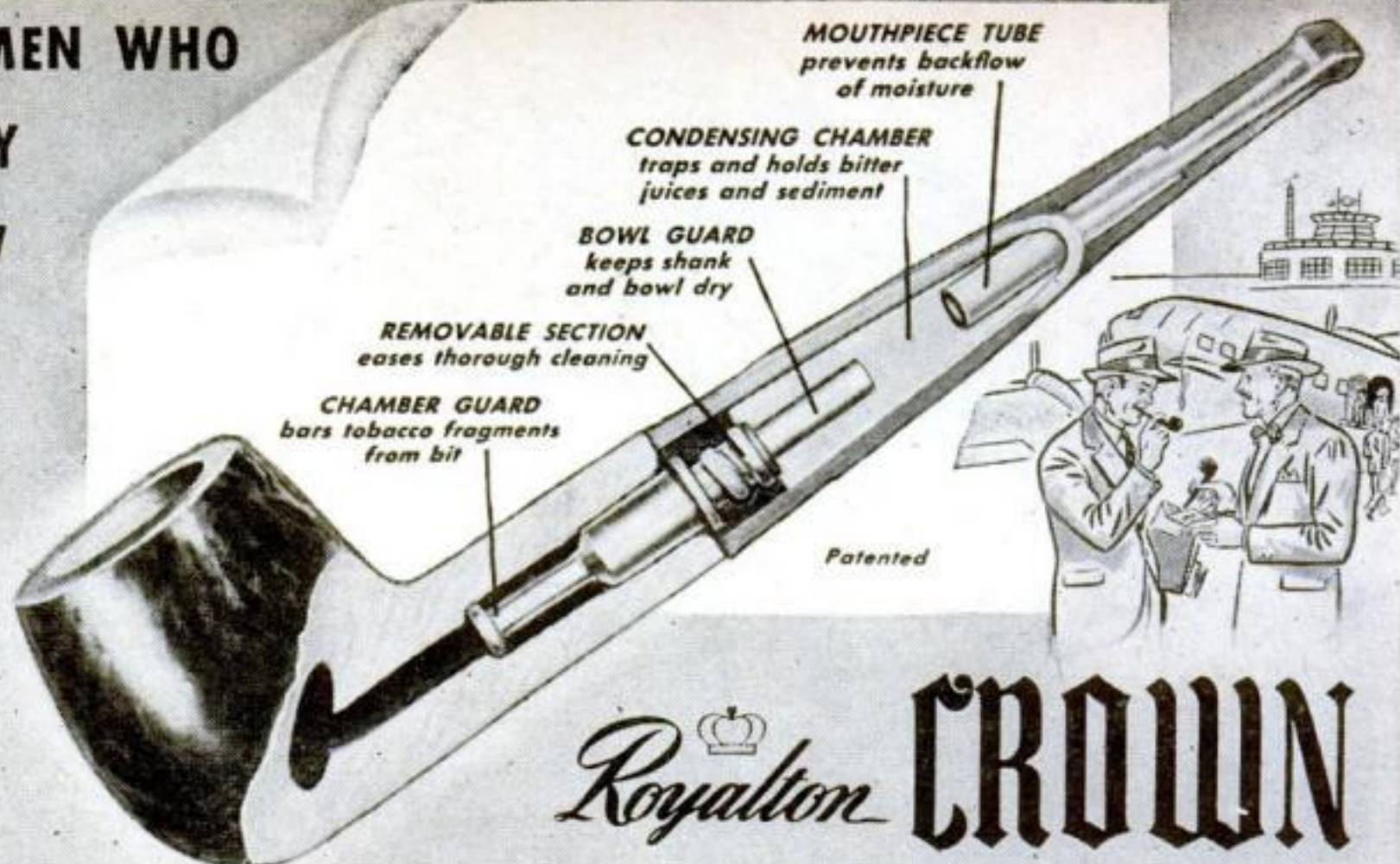
JULY, 1945

Buy War Savings Bonds and Stamps regularly.

223

**FOR MEN WHO
REALLY
KNOW
PIPES**

\$1.50
Selected
Briar



Royalton **CROWN**

YOU TASTE ONLY THE SMOKE when your pipe is a Royalton Crown. Bitter juices and slugs are taken into protective custody—permanently trapped by the condensing well and other patented features of this pipe. Its construction, different from all other pipes, keeps bowl and mouthpiece dry and cool . . .
HENRY LEONARD & THOMAS, INC., OZONE PARK 13, N. Y.

**DO YOUR DUTY —
BUY WAR BONDS**



Here's one thing you can do while
you're waiting for restrictions to be lifted on outboard motors:

**Ask the owners of Sea-Horses if they
aren't glad they paid a little more—
to get the best.**

It will be the same after the war. Get a Sea-Horse, even if
you have to wait for delivery. You'll never be sorry. Years
of extra service and top performance *all* the time, will
more than repay you for your wait.



**JOHNSON
SEA-HORSES**
for DEPENDability

**JOHNSON MOTORS
WAUKEGAN, ILLINOIS**





The "Flying Jeep" has a hundred war jobs — including photo and reconnaissance work, artillery spotting, tank direction, bringing out wounded, and personnel transfer.



The postwar "Flying Jeep" will have a multitude of light plane uses . . . vacation trips, inter-city travel, for aero-clubs, ranchers, farmers, and surveyors.

Other planes designed and developed by Consolidated Vultee are:



LIBERATOR . . . 4-engine bomber



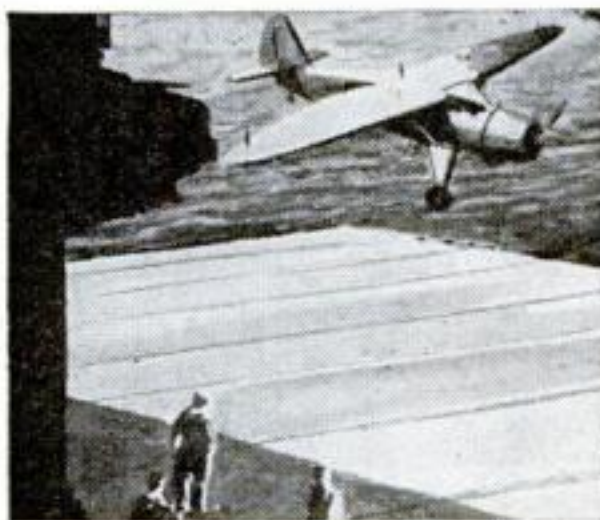
LIBERATOR EXPRESS . . . transport



PRIVATEER . . . search bomber



CATALINA . . . patrol bomber



RELIANT . . . navigational trainer



VALIANT . . . basic trainer

CONSOLIDATED VULTEE AIRCRAFT CORPORATION

San Diego, Calif.
Vultee Field, Calif.
Fairfield, Calif.

Tucson, Ariz.
Fort Worth, Texas
New Orleans, La.

Nashville, Tenn.
Louisville, Ky.
Wayne, Mich.

Dearborn, Mich.
Allentown, Pa.

Elizabeth City, N. C.
Miami, Fla.

Member, Aircraft War Production Council

SEA LEVEL TO STRATOSPHERE

AC is chosen for utmost Reliability

Back in "civvies," TWA's great Stratoliners are again furnishing de luxe transportation from ocean to ocean. TWA has reconverted and equipped all five Stratoliners for *utmost reliability*, choosing AC Ceramic Aircraft Spark Plugs to fire the powerful engines.

TWA is one of several leading airlines whose engineers pin their faith on AC—just as do the engineers of 2 out of every 4 cars, trucks and coaches built in America.

During World War I, AC developed the first and only ceramic aircraft plugs for Liberty engines. Constantly improved, these plugs have helped to make aviation history, from Lindbergh's conquest of the Atlantic to the newest records of the Constellation and the C-97. Their war record extends from Berlin to Tokyo. So, too, does that of AC's automotive spark plugs—the kind you use in your car, truck or motor boat.

AC SPARK PLUG DIVISION • GENERAL MOTORS CORPORATION



One of TWA's 4-engine Boeing Stratoliners, Navajo, Apache, Zuni, Comanche and Cherokee, whose 1200 h.p. Wright engines are kept firing by AC Ceramic Aircraft Plugs.

AC SPARK PLUGS

SPEED FINAL VICTORY — BUY WAR BONDS

Fishhook Holders Formed from Wire and Cork

GUTTED hooks kept on this holder will not become tangled in the tackle box. If three or four are made, all the hooks being used on a single fishing trip can be dropped into the water with a string attached to let the gut soften. Notice how the wire is bent at the top so that the loops of the gut can be quickly attached or detached. Use a large cork and light wire so that if you accidentally drop the holder—and hooks—overboard, the cork will keep it afloat.—R. P. DIERKES.

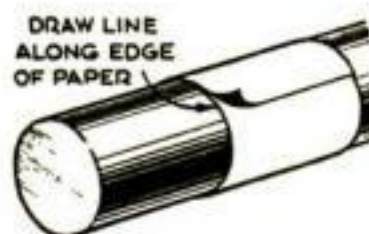


TWISTED WIRE INSERTED IN BOTTLE CORK

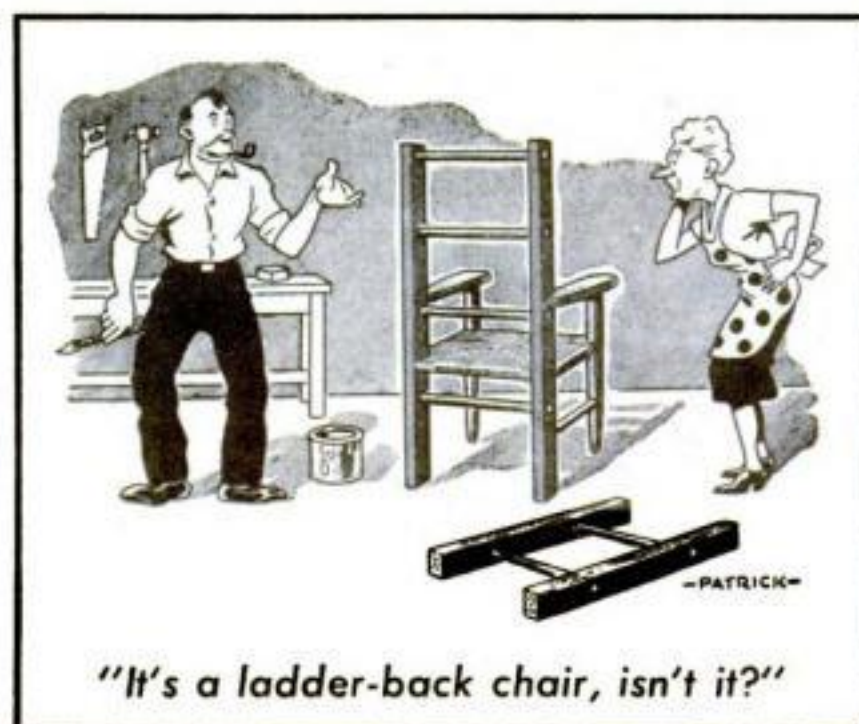
Cylinder Squared for Cutting by Use of Sheet of Paper

CYLINDRICAL objects such as pipes, columns, and the like can be squared true with their sides by wrapping a sheet of paper around them until the ends meet. At least one edge of the paper must be straight.

After the sheet has been wrapped flat against the cylinder, a mark with chalk or pencil along the edge will serve as a cutting guide.—M. LIGOCKI.



DRAW LINE ALONG EDGE OF PAPER



"It's a ladder-back chair, isn't it?"

Man-What a Hose Clamp!

NO GEARS * NO BOLTS
NO THUMB SCREWS



IT'S ALL
ONE PIECE



New Speed Clamp* Features

1. Exclusive, self-locking ratchet type design.
2. Lightest weight—lowest profile—sturdy spring steel construction.
3. Uniform circumferential pressure—no pinch or bind.
4. Faster and easier to install or remove.



Latch by hand



Lock with pliers



Remove with screw driver

Widely used throughout military aircraft. May be used over and over again. Sizes from 1/2" O.D. up. In writing for samples, please give outside diameter of hose with fitting inserted.

TINNERMAN PRODUCTS, INC.
2022 FULTON ROAD CLEVELAND 13, OHIO

In Canada: Wallace Barnes Co., Ltd., Hamilton, Ont. In England: Simmonds Aerocessories, Ltd., London

*Trade Mark

Speed Nuts

PATENTED

Trade Mark Reg. U. S. Pat. Off.

FASTEST THING IN FASTENINGS



Speed Clamps for hose connections are engineered and produced by the manufacturers of the famous SPEED NUT shown above.

JULY, 1945

Buy War Savings Bonds and Stamps regularly.

227



Quick, Ma! Hand me the Weldwood Glue!

When you want to fix things fast . . . remember Weldwood Glue. It's quick to mix . . . easy to use . . . tremendously strong . . . stain-free . . . rot-proof . . . and permanent. At hardware stores, lumber yards, chain stores.



WELDWOOD
PLASTIC RESIN
WATERPROOF GLUE

UNITED STATES PLYWOOD CORPORATION, New York 18, N. Y.

Kills Mildew! saves stored articles!

MILDEW IS A SCOURGE which can be more destructive than rats, moths or vermin. It can damage or destroy those precious articles so difficult to replace today. Now a new liquid—Mil-Du-Rid—has been scientifically developed to rid your home of mildew.

Mil-Du-Rid kills mildew instantly, prevents its return for months. Just spray shoes, luggage, clothing, canvas equipment and all stored articles with Mil-Du-Rid, and save them from mildew damage. Get Mil-Du-Rid from your department store, paint, grocery or hardware store.

MIL-DU-RID



An
Interchemical
Product

Interchemical Corporation
Trade Sales Division, Dept. N-75
Fair Lawn, N. J.

Please send folder "What is Mildew?
How to prevent it" to:

Name

Address

Dealer's name

ADD POWER to your CRAFT SKILL



Write on steel . . . engrave on glass, plastics . . . slice into wood, linoleum, cardboard, cloth . . . tool leather . . . hammer, file, chisel . . . do "hand quality" work with

**BURGESS
vibro-tool**

Trade Mark Reg. U. S. Pat. Off.

Vibro-Tool complete with 20 ordinary engraving needles \$7.50

Vibro-Tool plus complete set of attachments \$11.70

We can accept priority rated orders only. Attach check or M. O., or sent C.O.D.



Tools Leather



Carves Wood



Engraves Glass



Slices Cardboard

(HANDICRAFT DIVISION)
BURGESS BATTERY COMPANY

176 N. Wabash Ave., Chicago 1, Ill.

TERRIFIC BARGAINS

IN WAR SURPLUS

LENSES AND PRISMS



All Items Finely Ground and Polished but Edges Slightly Chipped or Other Slight Imperfections which We Guarantee Will Not Interfere with Their Use. Come Neatly Packed and Marked.

YOU CAN EASILY MAKE

Telescopes, Magnifiers, Photographic Gadgets and Hundreds of Experiments with these Low Cost Lenses.
To translate millimeter measurements; 25.4 mm. equals one inch.

TANK PRISMS

90-45-45 degree prisms of huge size—5 3/4" long, 2 1/8" wide, finely ground and polished. Used to build a Periscope . . . excellent also for experiments, classroom demonstrations at high schools, colleges, camera clubs, astronomy clubs. Some of our ingenious customers have used these Prisms to make camera stereo attachments, photometer cube, range finder, etc. Normally, these Prisms would retail from about \$24 to \$30 each.

Stock # 3004-N . . . SILVERED TANK PRISM—Price \$2.00 each. Postpaid. Illustrated Booklet on Prisms included FREE.

FOUR SILVERED TANK PRISMS—Special—\$7.00 Postpaid . . . This is the most sensational bargain we have ever been able to offer.

PORRO PRISM SET FROM ARMY'S 6 POWER BINOCULAR. Consists of 2 Porro Prisms to make an erecting system for a Telescope.

Stock # 3010-N . . . \$2.00 Postpaid

MISCELLANEOUS ITEMS

Stock No.	Item	Price
3006-N	Porro Abbe Prism	\$.25 each
3016-N	Pentagon Prism . . . . .	.75 each
2024-N	10 Pieces Circular A-1 Plate Glass (Diam. 31 mm.—for making Filter) . . . . .	.25 each
1004-N	2 Reducing Lenses	1.20
3001-N	Lens Surface Prism	2.00 each
503-N	No. 1 Sable Hair Lettering Brush	1.00 dozen
3021-N	Amici Roof Prism (3rd Grade) . . . . .	.25 each
4009-N	Heat Absorbing Glass 4" x 5" . . . . .	.35 each
4010-N	Heat Absorbing Glass 2" x 2" . . . . .	.10 each
2020-N	40 mm. Neg. Lens, Cross Lines . . . . .	.25 each
3020-N	Right Angle Prism 48 mm. wide (3rd grade) . . . . .	.35 each
523-N	Six Threaded Metal Reticule Cells . . . . .	.25
26-N	First Surface Aluminized Mirror, Diam. 1 1/4" . . . . .	.25 each
1027-N	Perfect Plano-Convex Lens, Diam. 12.5 mms., F.L. 20 mms. . . . .	.30 each
624-N	Neutral Ray Filter size 4 3/4" x 2 1/2" . . . . .	.25
3022-N	Round Wedge 65 mm. Diam.	5.00 each
3036-N	Roof Prism—80 Degree . . . face 1 5/8" wide	4.00 each
22-N	Inclinometer—Aircraft type . . . . .	.25 each
704-N	Lens Cleaning Tissue, one ream (480 sheets) size 7 1/2" x 11"	1.50
6002-N	Educational Set, 1 blank and 1 finished Porro Prism (3rd grade) . . . . .	.25 set
1003-N	50 Power Microscope Lens Set . . . . .	.70 each
1028-N	8 Power Mounted Magnifier (Minimum order—\$1.00)	.35 each

PERFECT ACHROMATIC TELESCOPE OBJECTIVE LENS
Diam. 1 3/4 inches, F.L. 20 inches.
Stock # 6091-N \$5.00 Postpaid

SPECIALS IN LENS SETS

Big 10 Page Project and Idea Booklet with all sets.

Set # 1-N "Our Advertising Special" 15 Lenses for \$1.60 Postpaid. For making your own powerful telescopes, low power microscope, strong magnifiers, drawing projector, photo cells, telephoto lens, dummy focusing camera, Kodachrome viewer, stereoscopic viewer, ground glass and enlarging focusing aids. For experimental optics, portraits of babies and small pets, copying, ultra close-up shots, and many, many other uses.

Set # 15-N—"The Experimenter's Dream"—62 Lenses, Prisms and Optical Items, and New 50-Page Book, "Fun with Chipped Edge Lenses". \$15.00 Postpaid. The variety of Lenses and Prisms in this set will enable you to conduct countless experiments, build a great variety of Optical Equipment. A sensational buy.

NEW 50 PAGE IDEA BOOK "FUN WITH CHIPPED EDGE LENSES"

Contains wide variety of projects and fully covers the fascinating uses of all Lenses in sets listed above . . . only \$1.00 Postpaid.

MFG. FOR NAVY'S 7 POWER BINOCULARS KELLNER EYE-PIECE LENSES you can use in Telescopes, Binoculars, Microscopes, etc. Diam. of eye lens 16 mm. Diam. of field lens 25 mm. Eye achromat already cemented.

Stock # 6108-N \$1.00 Postpaid

8 MM. MOVIE PROJECTING LENS SET—Consists of 2 Achromatic Lenses, diam. 15 mm. and a F.L. when combined of approx. one inch. Each lens has the new magnesium fluoride low reflection coating.

Stock # 4011-N \$1.40 Postpaid

RETICLE SET Five assorted, finely engraved Reticles from U. S. Gunsights. An usual group . . . just like those assisting our gunners to train sights on Tokyo. Worth several dollars each.

Stock # 2035-N \$1.00 Postpaid

RAW OPTICAL GLASS An exceptional opportunity to secure a large variety of Optical Pieces both Crown and Flint glass (seconds) in varying stages of processing. Many prism blanks.

Stock # 703-N 8 lbs. (minimum weight) \$5.00 Postpaid

Stock # 702-N 1 1/2 lbs. \$1.00 Postpaid

MAGNIFIER SET 5 Magnifying Lenses . . . Powers from 1 to 10. Various diam. for many uses.

Free Booklet on Home-made magnifiers included.

Stock # 1026-N \$2.00 Postpaid

TANK PERISCOPE

Complete Set Mounted Components

Have fun! Make a real Periscope. Use it to see over the heads of crowds, to see under water, to see out windows without yourself being seen, and many other uses where observation by "remote control" is required. Originally constructed, for U. S. Army Tanks, set consists of 2 fine Periscope mirrors mounted in metal and plastic. Only plywood body frame is required to finish this exceptional Periscope. Set weighs 2 3/4 lbs. Overall length 6 1/8", width 2 1/8". Would normally retail at \$40 to \$50. Stock # 700-N. \$3.00 Complete Set Postpaid (Two Sets (four units) Special \$5.50 Postpaid)

Order by Set or Stock No.—Satisfaction Guaranteed

EDMUND SALVAGE COMPANY-P.O. AUDUBON, NEW JERSEY

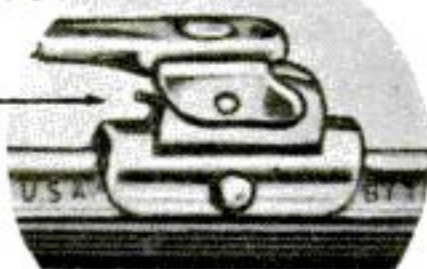
ANCO RAIN-MASTER

"Dead-Locker"

WINDSHIELD WIPER
ARMS and BLADES

BLADE SNAPS ON...
STAYS PUT

FINGER-
TIP
RELEASE



CAN'T FALL OFF
CAN'T BLOW OFF

(A war-born invention—by ANCO—first)
for military aircraft—now for your car.)

DON'T SHOOT YOUR GAS-PUMP MAN!

He's doing the best he can. Sure, he knows how dangerous it is for you to drive your car... in stormy weather... with your dull old windshield wipers that smear and smear. He'd gladly put on for you quickly a pair of keen new ANCO RAIN-MASTER Wiper Blades and Arms. He has them. But he forgets to remind you? Too busy? It's the war! You can't shoot him for that.

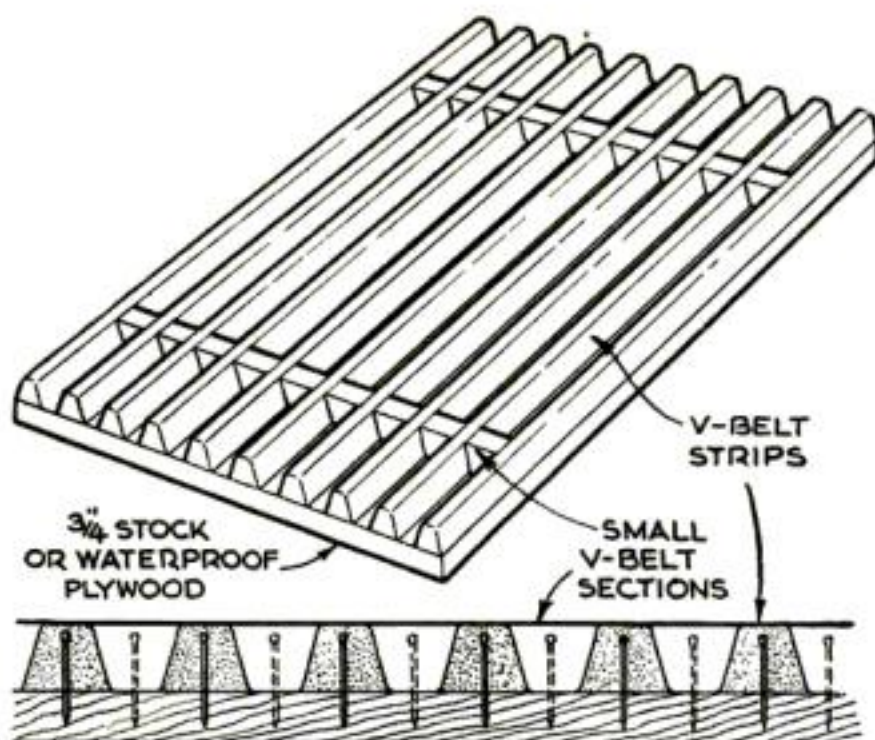


PATENTS
MAKE JOBS

After all, it's *your* car to protect. So *you* remind *him*. Get RAIN-MASTERS... patented features... original equipment on many makes of high grade peace-time cars... used on our fighting tanks and trucks and ships and bombers too... because ANCO RAIN-MASTERS clean quicker, clean cleaner... last longer. May save you a costly smashup.

Ask for RAIN-MASTER Windshield Wiper
Arms and Blades next time you buy gas.

THE ANDERSON COMPANY
Established 1918
GARY, INDIANA



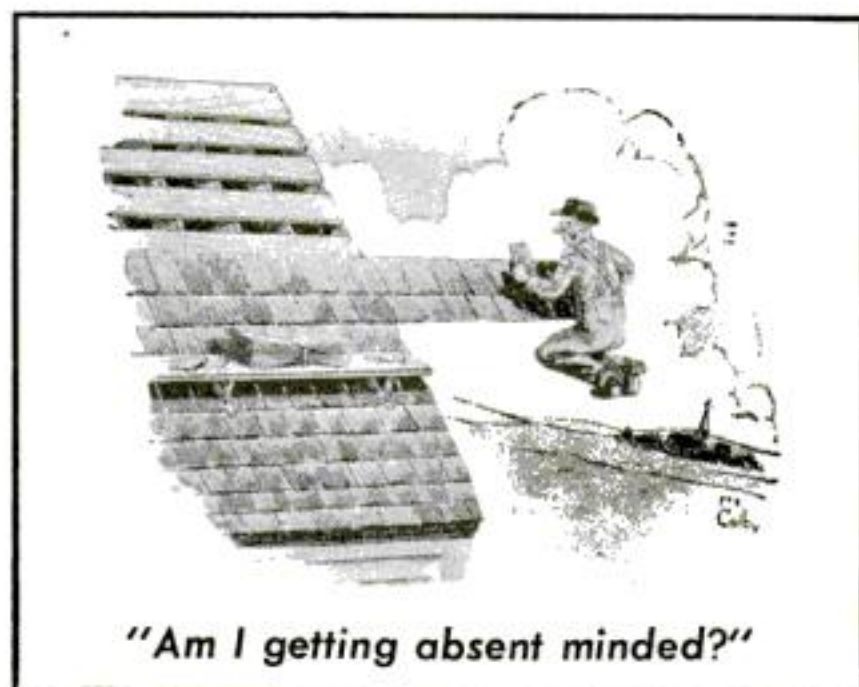
Lengths of Discarded V-Belt Make Unusual Doormat

DISCARDED V-belts can be put to use again as a doormat if you have or can obtain several of them. Cut the belts into strips about 2 ft. long, or place shorter pieces end to end to make up the required length. Use finishing nails to fasten the strips to a piece of $\frac{3}{4}$ " stock or waterproof plywood, as shown above, driving in the heads with a nail set. Separate the strips with inverted sections of belt.—AXEL E. OGREN.

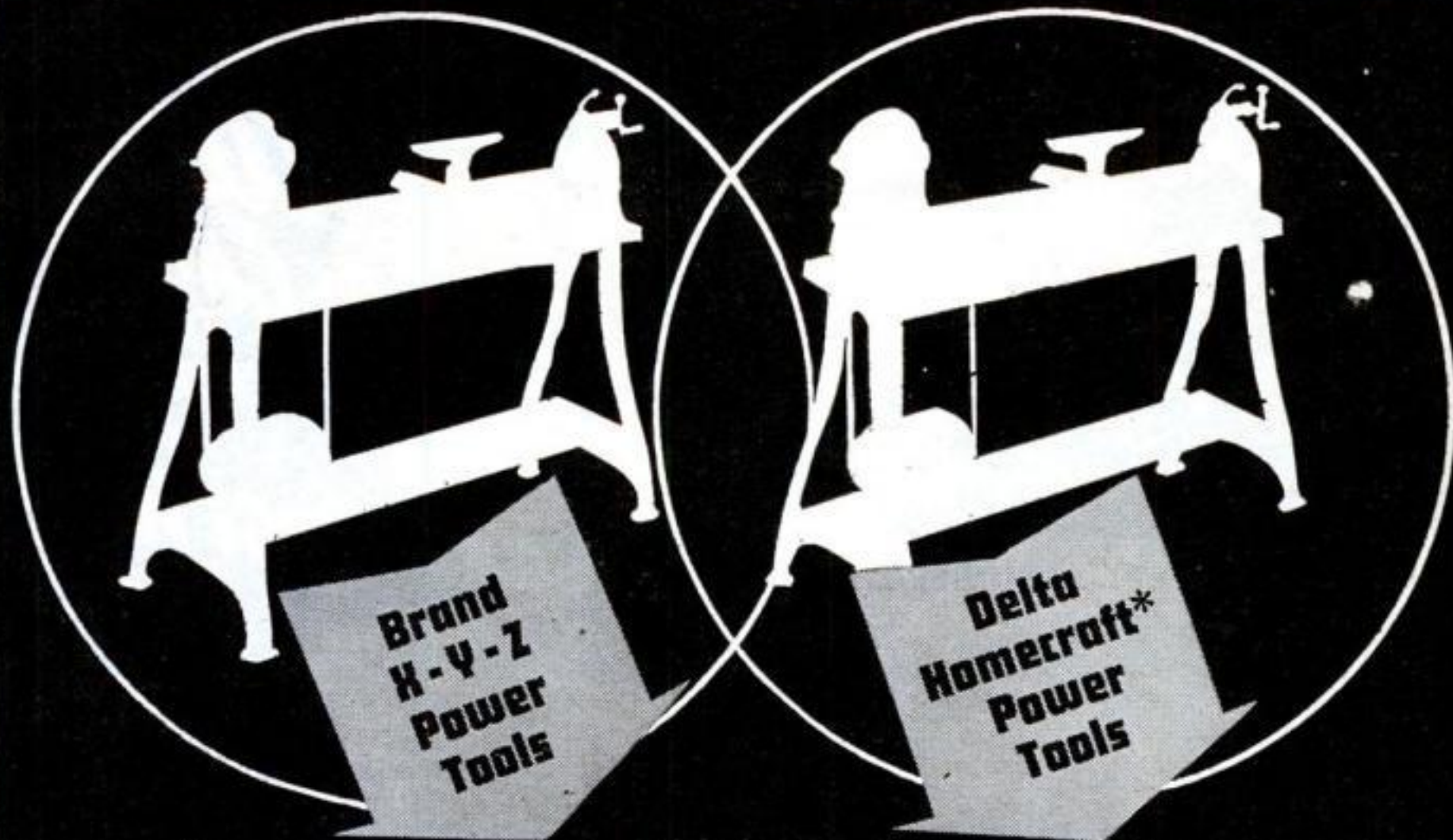


Broken Hacksaw Blades in Jigsaw Cut Metal

HEAVY metal work puts a strain on the delicate blades of a power jigsaw even though only straight cuts are made. You can save these blades and get much sturdier service by using a broken hacksaw blade. Grind the ends so they will fit the jigsaw chucks.—D. S. G.



"Am I getting absent minded?"



**These Lathes are "TWINS" in the Store . . .
but the *advanced engineering* of the DELTA LATHE
means *greater satisfaction* in your homecraft shop**



**Plans for Boat
That's Fun to Build
. . . Fun to Use!**

Complete plans for building a lightweight, sturdy, 11½-foot utility boat—for use with oars or outboard motor. Full-size patterns for most members of boat. Simple, easy-to-understand instructions. A worthwhile project that provides you with hours of pleasure in building—and gives you a real feeling of accomplishment when finished. Boat can safely carry 3 people. Get your set of boat plans now, so that you can start building soon. Mail a dollar bill or money order to us today.

\$1

POSTPAID

*Trade Mark Reg. U. S. Pat. Off.

"Hidden values" in Delta Homecraft Power Tools assure you of trouble-free performance

The *quality* of your power tools has a lot to do with determining whether you miss out on some of the happiness your woodworking hobby can offer — or whether you enjoy *all* of it.

Delta Homecraft Power Tools have a reputation for *quality*. Yet, you can't always *see* Delta quality with your eyes. Because it doesn't make Delta tools look much different from other makes of power tools.

But *quality is* there — in industrial-type construction features that mean a lot to your contentment . . . help you obtain accuracy with ease . . . and help you enjoy economy, dependability, safety.

In selecting *any* power tool — lathe or otherwise—it pays to choose *Delta*, to get built-in values like these:

Lubricated-for-life Ball Bearings

You don't have to worry about oiling these bearings. And they are double-sealed against harmful dust, to assure you of longer bearing life.

Pre-loaded Bearings

This is the result of an extra manufacturing operation that reduces the "play" in the bearings, to help you enjoy long-time operating efficiency and accuracy.

Precision-bored Bearing Seats

These bearing seats help keep all parts

lined up properly, so that you have greater assurance of producing finished pieces exactly according to dimensions.

Precision-ground Shafts

These are shafts built to run without any "wobbling" which might throw off your measurements.

Dynamically-balanced Pulleys

These pulleys — which transmit the power from your motor to your power tool — are balanced to help eliminate annoying, damaging vibration.

If you are a woodworking hobbyist — or are anxiously awaiting the day when you can become one—plan now on enjoying the pride of owning Delta Homecraft Power Tools, the famous tools with the quality features that help you get the most out of your exciting hobby.

Right now, save for your happiness — and earn the right to enjoy it — by buying and holding War Bonds.

THE DELTA MANUFACTURING CO.
682G E. Vienna Ave., Milwaukee 1, Wis.

The line of Delta Homecraft Power Tools includes Delta Scroll Saw, Delta Band Saw, Delta Circular Saw, Delta Lathe, Delta Drill Press, Delta Jointer, Delta Grinder, Delta Shaper.

Delta
MILWAUKEE
Homecraft
Power Tools

New Bedroom for Betty?

Brighten up Living Room?

Basement Recreation Room?

Insulate the Attic?



Come out of that Quandary...

HERE'S REAL HELP IN MODERNIZING!

- What can you do right now to modernize your home? How *much* can you do? What will it cost?
- Today, it's easy to get real help in answering these questions! Today, you can make many of your dreams a reality! For example:



BUILD THAT NEEDED ROOM!

Beautiful modern rooms like this are easy to create in your attic—at low cost—with Nu-Wood Interior Finish. Nu-Wood has soft,

- fadeproof colors... jewel-tinted moldings. And Nu-Wood is low in cost—easy to apply.



BRIGHTEN THAT LIVING ROOM!

Cracked plaster—peeling paint—dingy walls! Nu-Wood hides them with a surface of fresh beauty. In living rooms or dining rooms—in

- bedrooms—in attic or basement rooms—Nu-Wood will give your home that *modern* look!

Balsam-Wool

GUARANTEED SEALED INSULATION

THE KEYNOTE OF COMFORT!

Use Nu-Wood to bring beauty into your home. Use Balsam-Wool to provide more comfort. Mail coupon for complete information.



WOOD CONVERSION COMPANY
Dept. 211-7, First National Bank Bldg.
St. Paul 1, Minnesota

Please send me more information about modernizing homes with Balsam-Wool and Nu-Wood. I am a Home owner ☐, Renter ☐, Architect ☐, Contractor ☐, Student ☐.

Name.....

Address.....

City..... State.....

BALSAM-WOOL • PRODUCTS OF WEYERHAEUSER • NU-WOOD



64 pages crammed full of useful information... action pictures of machining operations... unique features of construction and helpful facts for selecting your shop equipment... send for your copy today.



ATLAS PRESS COMPANY
755 N. Pitcher St., Kalamazoo 13D, Mich.

LATHES • DRILL PRESSES • SHAPERS • MILLING MACHINES

FREE! MOST COMPLETE RADIO PARTS CATALOG



EVERYTHING in RADIO ELECTRONICS for Training, Maintenance or Repair



New R-F. Resonance and Coil Winding Calculator
No. 37-955. Postpaid, 25c

Parallel Resistance & Series Capacitance Calculator
No. X37-960. Postpaid, 25c

RADIO'S FINEST BOOK VALUES

Specially prepared to aid radio training in schools and industry. Full of valuable data. Send for all six!

- Radio Formulas and Data Book No. 37-752... 10c
- Dictionary of Radio Terms No. 37-751... 10c
- Radio Circuit Handbook No. 37-753... 10c
- Radio Builders' Handbook No. 37-750... 10c
- Simplified Radio Servicing No. 37-755... 10c
- Radio Data Handbook No. 37-754... 25c
- All Six Books No. 37-799... 75c

ALLIED RADIO CORP.

833 W. Jackson, Dept. 7-G-5, Chicago 7



6 BOOKS FOR 75c

ALLIED RADIO

PiB

AMAZING LIQUID INSULATION

Stops "Shorts" in Your Shop!



PiB is the new miracle liquid insulation used by the Army and Navy on vehicle engines during amphibious operations. It's the answer to hundreds of insulation jobs in the commercial or home shop.

PiB helps batteries keep their "kick" by preventing corrosion and fighting shorts be-

tween terminals. Seals old insulation. **PiB** flows easily ... penetrates ... dries pliable ... endures. It moisture-proofs ignition systems, helps start rain-stalled engines. Use on any electric motor or gasoline engine ... industrial and farm machinery ... home appliances, boats, planes.

1 TREATMENT FOR 6-MONTH SAFETY!

1-oz. bottle ... 75¢ 4-oz. bottle ... \$1.50

Send **TODAY** for **FREE** booklet on **PiB**

U. S. Industrial Chemicals, Inc. Dept. E-1
60 E. 42nd St., New York 17, N. Y.

USI Product



Get **PiB** at service stations—
hardware, electric, dep't stores!

A TOOLSHOP IN YOUR HAND!

HANDEE **TOOL OF 1001 USES**

- GRIND • DRILL
- POLISH • ROUT
- ENGRAVE • CUT
- CARVE • SAND
- SAW, etc.

The original hand tool and today's finest for precision work on any metal, alloy, plastic, wood, horn, bone, glass, etc. Fits your hand comfortably, perfectly balanced, weighs only 12 ounces—it's the "non-fatiguing" tool. And Handee's usefulness is as extensive as the number of quick and easy-to-change accessories you own...choose from more than 300 in the Chicago line. Operates on AC or DC current at 25,000 r.p.m. With 7 accessories, postpaid **\$18.50**



Write for free new 64-page catalog
CHICAGO WHEEL & MFG. CO.
1101 W. Monroe St., Dept PO, Chicago 7, Ill.

"HARLEY-DAVIDSONS Took a Beating

... AND STILL KEPT ON RUNNING!"

Harley-Davidson's in the thick of it? Read this from Pfc. Glenn S., recovering from wounds received in France:

"Was a dispatch rider for the Signal Corps, and at the time I was shot, I was on one of your Harley-Davidson 45's. I rode for ten months and that motorcycle really took a beating and still kept running. There were 135 in our company and every man was issued a Harley-Davidson 45. We gave them a lot of abuse but they still ran in tip-top condition. Every one of our boys says his first purchase after the war is going to be a new Harley-Davidson."

That's a swell tip, Pfc. Glenn S., to every fellow who's looking forward to the fun and thrills of motorcycling in the happier peace days to come!

HARLEY-DAVIDSON MOTORCYCLES

HARLEY-DAVIDSON MOTOR CO.
Department PS, Milwaukee 1, Wisconsin

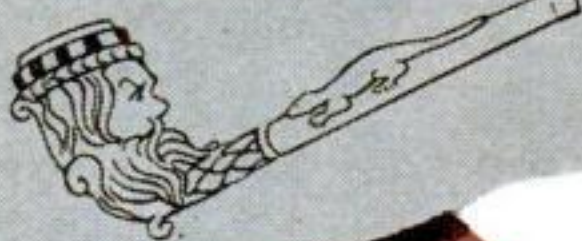
Please send at once free copy of 24-page "Enthusiast" Magazine, filled with motorcycle action pictures and thrilling stories.

Name.....

Address.....

City..... State.....

ANCIENT PIPE OF FRANCE



Today you see the

LHS
STERNCREST
STERLING

in FRANCE, and everywhere

Strutting along the Rue de Rivoli, right now, is an American G. I. puffing away on his LHS—and many others are doing likewise, the world over.

That's why LHS's are limited in supply, but not in workmanship or materials.

War over (and would that it were!) we couldn't produce a better pipe than the Sterncrest of today. It's prewar quality, from its briar bowl to its hard rubber bit.

After the war, more models to choose from, but no finer pipes.

\$5

This is No. 46
Plain Finish

Also in Antique finish.
Dozens of other models

Other LHS Pipes:

\$10—LHS
Sterncrest Ultrafine

\$7.50—LHS
Sterncrest 14K

\$3.50—LHS
Certified Purex



Supplies limited
—you may have
to wait for some
models, but it's
worth it!

IMPORTED
BRIAR

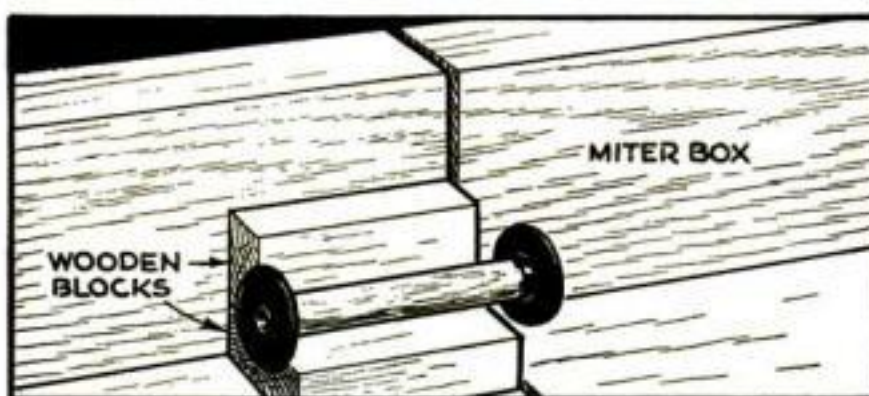
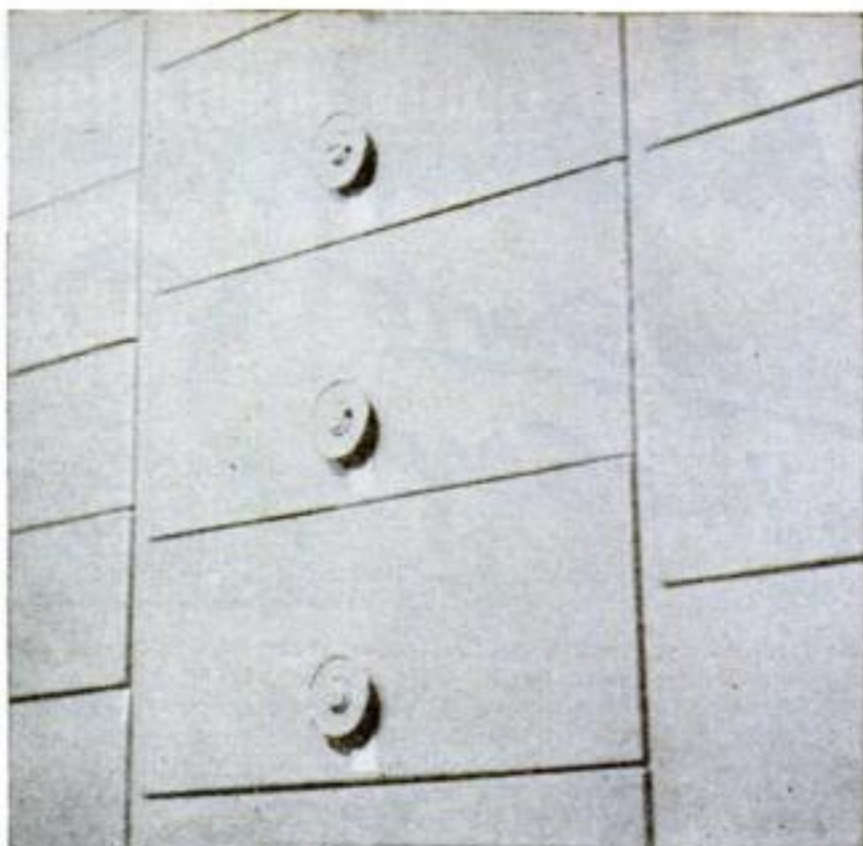
AT YOUR DEALERS



Write for "Pointers on Pipes"—FREE

L & H Stern, Inc., Stern Bldg., 56 Pearl St., Bklyn 1, N.Y.

Film Spools Make Good Pulls



HANDLES for light drawers can be made from roll-film spools by sawing across the wooden core about $5/16$ " from the metal flanges. Two wooden blocks arranged as shown above to hold the spool away from the side and bottom of the miter box will make the cutting easier. A hole already exists in the core to a depth of about $5/16$ ", but the neck of the pull can be made longer than that, of course, by drilling the hole deeper. Fasten the pulls to the drawers with roundhead wood screws or small bolts and nuts.—WILL THOMAS.

Mousetrap Used to Hold Bills



REMOVE the trigger from a new mousetrap and fasten the wooden block to a desk or wall with two brads or screws so that the spring faces downward. It will hold a surprising number of bills and letters. If painted an attractive color, it also can be used on the kitchen wall for grocery bills, recipes, and memos.



Whatever the **TEXTURE** of your **FOLIAGE..**

You can give your face that

**PROFESSIONAL
TOUCH!**

● Blackbeards, whitebeards, tough beards, beards-of-a-feather-like texture — all find smooth shaving comfort in PROFESSIONAL... the Blades that are precision-honed and micro-tested for keener, better shaving. **TOUCH and GO** means all that the words imply: a whisk and you're whiskerless! No matter what the color or density of your foliage, use PROFESSIONAL Blades for the best shave ever!

...for Real TOUCH and GO Shaving!



SINGLE OR
DOUBLE EDGE
**5 BLADES
FOR
25c**

PROFESSIONAL BLADE CO.

NEWARK 2, N. J.

**JUST
OUT!**

**NEW FULL-COLOR
HANDGUN POSTER**

20" X 35" —
SWELL FOR...
CLUBROOMS
OR YOUR DEN
AT HOME!

TELLS ALL ABOUT...
GREAT S & W
MODELS RIGHT
BACK TO 1854!

Ten-Ring Tips



YOURS FOR ONLY

10¢

**CUTAWAY
ILLUSTRATION
SHOWS JUST HOW
A MODERN
S & W
REVOLVER
WORKS!**

**SEND
YOUR DIME
TODAY!**

Smith & Wesson, Inc., Dept. P.S.
Springfield 2, Mass.

Mail my "Ten-Ring Tips" Poster at
once. 10¢ is enclosed.

NAME.....

STREET.....

CITY.....STATE.....

**WATCH
SMITH & WESSON**
Springfield 2, Mass.
FOR FIRSTS IN FIREARMS

THE FAITHFUL
HEART
OF YOUR FUEL
SYSTEM



AC FUEL PUMPS

Pulsing steadily, hundreds of times a mile, your AC Fuel Pump is the strong, reliable heart of your fuel system. It has given you long, faithful service because of its inbuilt quality and scientific design.

You can prolong that faithful service indefinitely, if you insist upon an AC when you replace your present pump with a new or rebuilt one.



BUY WAR BONDS • BRING VICTORY QUICKER

Buy War Savings Bonds and Stamps regularly.

PALMGREN



No. 000 ANGLE VISE
For MILLING—DRILLING—GRINDING
FITTING—FILING

Solve Difficult Angle Jobs

Quick, accurate setups at any angle. End make-shift methods—time loss—rejections. Ideal for tool rooms or home workshop. Accurately machined and graduated. Once set it stays locked. Jaws hardened steel—plain or grooved. Sizes 1½" to 8" Jaws.

DRILL PRESS VISES

For tool room, machine shop, school shop, home shop or repair shop. Accurately machined. Best semi-steel castings. Adjusting screw of hardened steel with fine pitch thread and long bearing. Jaws hardened steel, grooved or plain. Sizes 1½"-2½"-4" Jaws.



No. 250 MILLING ATTACHMENT VISE

A most necessary fixture for small shops and even emergency work in large ones. Fits any 8"-9"-10" South Bend, Atlas, Craftsman, Sheldon or other lathes of similar sizes. Has graduated vertical feed screw and 360 degree graduation for vertical angle adjustments. Easily mounted on cross slide and held by one T-slot bolt. Equipped with PALMGREN VISE, 2½" Jaws opening full 2½". Vise has one plain and one grooved jaw for holding round pieces.

MAKES MILLING OPERATIONS POSSIBLE ON ANY LATHE

Width	Depth	Opening	Jaw	Jaw	Jaw	Height	Price
2½"	1-7/16"	2½"	10½"				\$24.75

ORDER DIRECT—Write for Circular No. 347
CHICAGO TOOL AND ENGINEERING CO.
8396 South Chicago Avenue Chicago 17, Ill.

"EVERYTHING Metal Items
Need In an Oil"

★ THE NEW ★
FIENDOIL 35c
Lubricates— Cleans—
Protects 2 oz. size
McCambridge & McCambridge Co.
Baltimore 23, Md.



SUMMER COOLING

Parts, Cooler plans, Blower plans, Supplies. Special attachment to enable you to use, for cooling, your present furnace blower. Wholesale and Retail.
PEERLESS SALES Sheridan Blvd. at 44th, Lincoln 6, Neb.

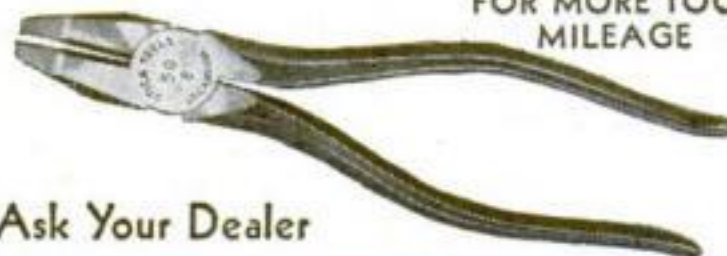
BUILD ARC WELDER FROM OLD GENERATOR

For Light or Heavy Work. 75-200 amperes. Complete PLANS 35c. Send today and we'll include FREE our BIG Catalog.
LEJAY Mfg. Co., 1323 Lejay Bldg., Minneapolis, Minn.



UTICA TOOLS

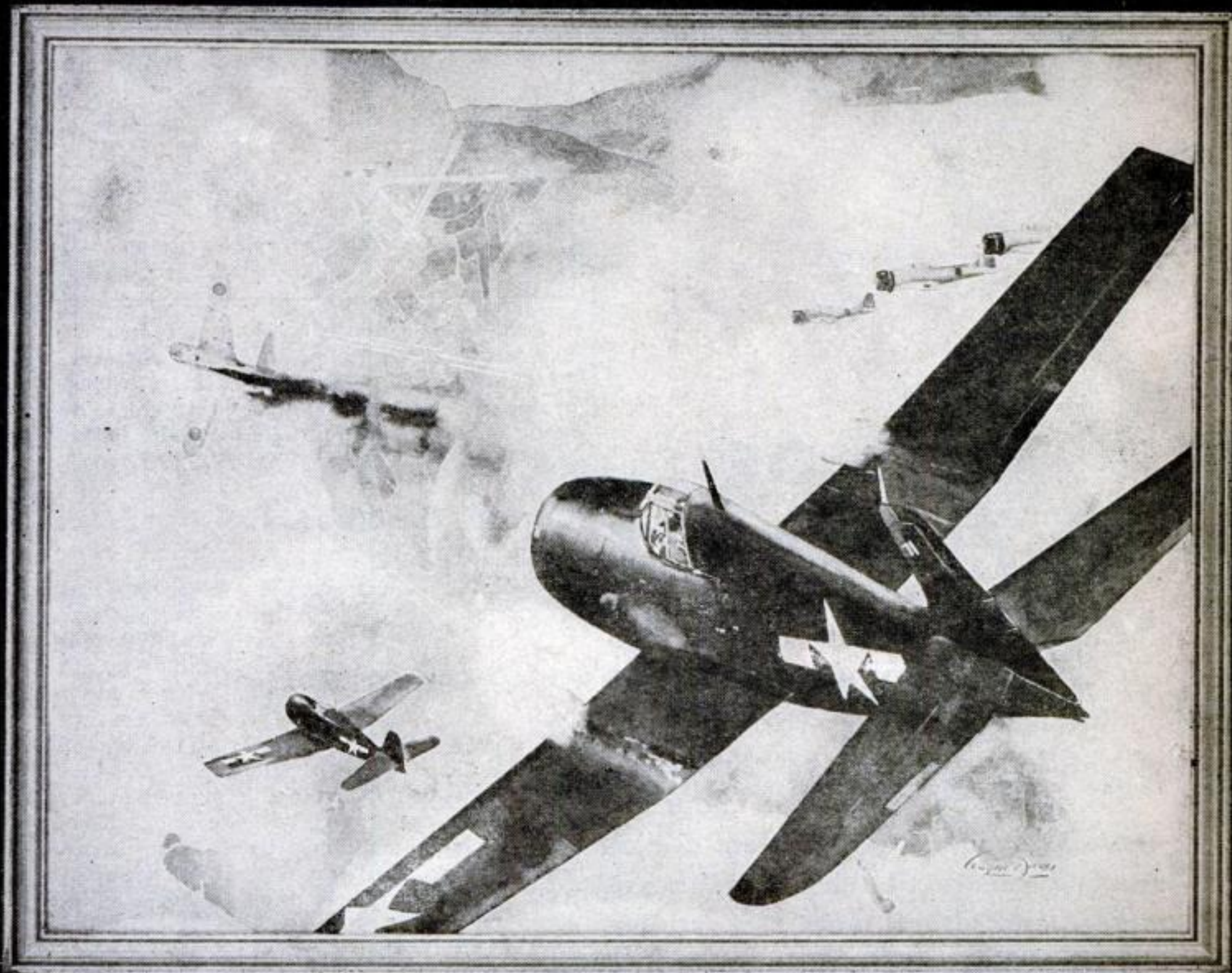
ALL TYPES
FOR MORE TOOL
MILEAGE



Ask Your Dealer

U • T • I • C • A

UTICA DROP FORGE & TOOL CORP.
★ UTICA, N. Y. ★



U. S. Navy's Grumman Hellcats Strike Over Japan

Grumman

AIRCRAFT ENGINEERING CORPORATION, Bethpage, L. I., N. Y.

Copyrighted material

TAKE HOLD..



..OF QUALITY

You're sure of top quality and performance when you take hold of a Millers Falls Hack Saw Frame.

No. 84 (shown above) is about the finest frame made. Its excellent design and fine construction details will serve you . . . and several more generations.

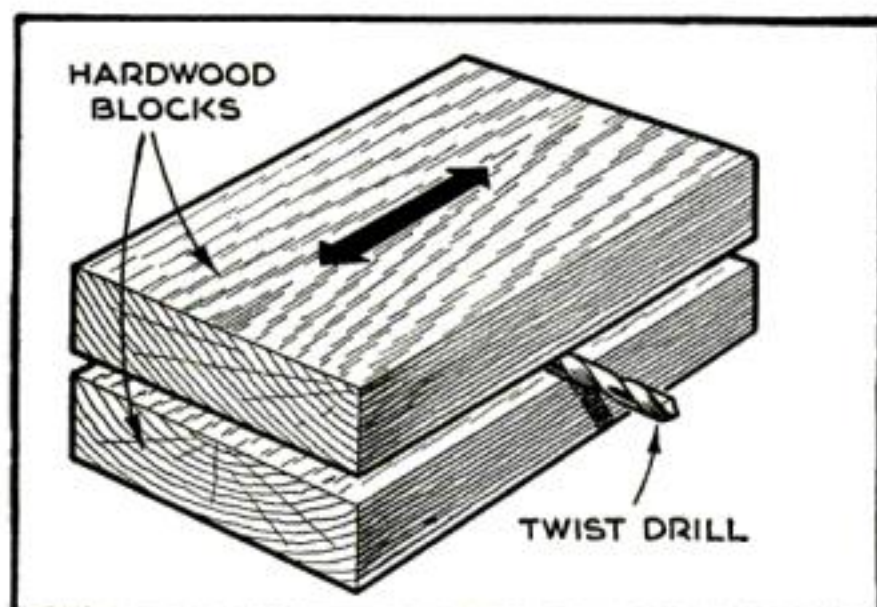
Millers Falls offers a complete line of *quality* hand and electric tools. Some are available now. Ask your dealer. He may have yours.

ONE THING
IN COMMON
QUALITY



MILLERS FALLS COMPANY
GREENFIELD, MASSACHUSETTS

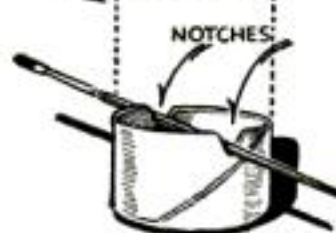
Twist Drills Are Straightened Between Hardwood Blocks



TWIST drills that have become bent in use can be straightened by rolling them between two hardwood blocks. Exert considerable pressure on the upper block while it is being thrust back and forth.—ALBERT JONES.

Carton Becomes Artist's Bowl

CARTON CUT INTO ARTIST'S
WATER BOWL AND BRUSH
HOLDER



AN ARTIST can convert an ice-cream carton into a water bowl that will stand up for a considerable length of time. With a razor blade, slice off the upper part of the carton to reduce it to the best working size. Notches

cut into the upper edge will prevent brushes from rolling off. Such a bowl should prove particularly useful for outdoor sketching if it is impracticable to take along a glass container.—ERIC SLOANE.

Wheels Mounted on Lag Screws



LAG screws and pipe nipples offer a solution to the problem of how to mount wooden wheels on a wagon or other homemade toy when the usual bearings are unavailable. The nipple threads into a hole of the proper size in the wheel. A lag screw of the closest fit then becomes an axle. A washer placed next to the head of the screw will let the wheel turn more easily.—ORSON L. DYER.



BELL
WATERPROOF

Waterproof, shockproof, radium dial and hands, anti-magnetic, unbreakable crystal, precision tested, sweep second hand.

No. FV 121 — 15 jewels, stainless steel back \$39.75

No. FV 331 — 15 jewels, stainless steel case \$49.50

No. FV 328 — 17 jewels, SELF-WINDING, stainless steel case \$59.75

POSTPAID FED. TAX INCL. • MAIL ORDERS PROMPTLY FILLED

Write for Free Illustrated Booklet "FV"

BELL WATCH COMPANY

Time-Life Bldg., Rockefeller Center, New York 20, N. Y.

New Canvas Paint finds dozen uses 'round the house



You have never used a paint like Setfast. A single application both beautifies and prolongs the life of awnings, canvas porch furniture, auto tops—and all outdoor canvas. Most amazing, Setfast does not stiffen canvas, nor chip off. Can be sprayed or brushed on. Get Setfast at your department store, hardware or paint store. 10 sun-resistant colors—also black, white and clear.



Setfast

CANVAS PAINT

An Interchemical Product

Interchemical Corporation
Trade Sales Division, Dept. RS-75
Fair Lawn, N. J.

Send canvas sample painted with Setfast.

Name

Address

My dealer's name

WINCHESTER batteries give you light *bullet-fast*

Since war began, Winchester batteries have helped get countless war jobs done. That's why Victory is coming nearer. When the war is won, Winchester flashlights and Winchester batteries will be available to you again. Winchester Repeating Arms Company, New Haven, Conn., Division of Olin Industries, Inc.



UNUSUAL LIGHTS THAT HAVE SERVED MAN...

In the dark days of Arctic winter the Eskimo, hunting seal for food, must search the ice for the seal's "breathing" hole. And it's barely the size of a penny! He uses a torch made of whale-blubber fat. Contrast this with the brilliant, *bullet-fast* light from Winchester flashlights and batteries.



WINCHESTER





Dear Bob:
You wouldn't know Mother now
that she can hear well again

... she goes to the movies and church with us and hears everything for the first time in years. She can hardly wait to hear about your experiences and share her new-found joy with you.

Our friends say it's a miracle. And I'll always bless the day I got her to go with me for a demonstration of that New Zenith Hearing Aid. She wouldn't part with it now for a thousand dollars...

* * *

If you have friends or relatives who do not hear well, suggest that they visit the nearest Zenith dispenser and try a new Zenith Radionic Hearing Aid. Their own ears will decide how much better they hear. No one will ask them to buy.

There are three new Zenith Radionic Hearing Aids, priced at \$40 and \$50, to aid practically every type of correctable hearing loss. And the new Neutral-Color Earphone is so inconspicuous... makes wearing a Zenith as little noticeable as eyeglasses.

Choice of Amplifier Colors at no Extra Cost.

THE NEW

ZENITH

RADIONIC HEARING AID

BY THE MAKERS OF ZENITH RADIOS



PASTE ON PENNY POSTCARD AND MAIL

ZENITH RADIO CORPORATION, Dept. PS-7A
6001 Dickens Avenue, Chicago 39, Illinois

Please send me your FREE booklet about the Zenith Radionic Hearing Aid.

Name.....

Address.....

City..... State.....

COPYRIGHT 1945, ZENITH RADIO CORP.

Buy War Savings Bonds and Stamps regularly.

HANDY FURNITURE KIT

Fixes Scratches, Dents, Nicks



You can easily restore beauty to damaged wood surfaces with this new practical kit. Enables anyone to do fast, easy touch-up jobs like a professional cabinet finisher. Repairs holes, burns, gouges, scuff marks, etc. Complete outfit—pays for itself over and over.

Amazing Results—Easy to Use

Kit includes 23 different items—scratch removers for slight scratches, assorted shades of shellac sticks for deep nicks, bottles of light and dark stains, shading lacquer, alcohol lamp with fuel, stainless steel spatula, touch-up brushes, scratch sticks, steel wool, sandpaper, rubbing liquid. Packed in handy leatherette finish case. Send for it today. Best investment of lifetime. Fully guaranteed. Detailed instructions supplied.

\$3.95

Postpaid

AMERICAN HOUSEHOLD BUREAU

Dept. A, 520 N. Michigan Ave., Chicago 11, Ill.

ARMSTRONG TOOL HOLDERS

enabled American Industry to change to war production "over night." For they are the permanent, multi-purpose tools used by 96% of the machine shops and tool rooms, on lathes, planers and shapers—the tools used to make dies and jigs, to build production machines. They are the tools you will want for your own shop after the war—ARMSTRONG TOOL HOLDERS for industry, ACE Tool Holders for home work shops.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

329 N. Francisco Ave., Chicago 12, U. S. A.



WHEN YOU BUY FLASHLIGHT BATTERIES ASK FOR

"EVEREADY" FRESH DATED BATTERIES

The word "Eveready" is the registered trade-mark of National Carbon Co., Inc.



USE YOUR BENCH SAW

With Our six in. tool steel cutters. Make mouldings, casings, drop-leaf tables, grooves beading & jointing 1" wide \$1.50, 1 1/2" \$1.75 ea. Postpaid. State size hole. List & folder free.

John A. Sandstrom, Box 517, Stow, N. Y.



After War

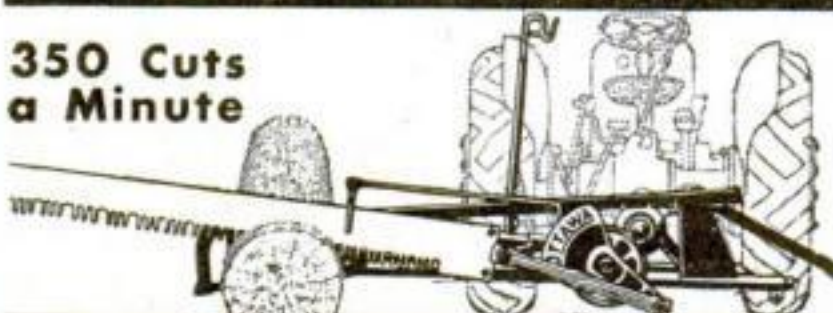
THE WORLD'S SAFEST ELECTRIC JIG
SAWS will again carry the name:

SYNGRO

SYNGRO DEVICES, INC.
FERNDAL 20, MICHIGAN

MAKE **BIG MONEY** SAWING WOOD NOW!

350 Cuts
a Minute



OTTAWA ONE-MAN TRACTOR SAW

Turn wood lots into cash; help save other fuels to win the war. Use Ottawa—fastest cutting; easiest way. Cuts large and small logs, fells trees. Thousands in use. Built to last with special heavy stiff saw blade. Positive safety clutch control, driven from any power take-off.

OTTAWA MFG. CO., D-701 Forest Ave., Ottawa, Kansas

FREE BOOK
and Price List

**A SEA-GOIN' MULE SKINNER
GETS WISE TO THIS**

"STAY-MOIST" SHAVE



120 TO 150 SHAVES IN
THE BIG RED TUBE

YOU'LL LIKE ITS MILD
FRAGRANCE

STOP SWEARING AT DULL BLADES

Allegro

HONES as well as strops



Stropping alone won't put a *new* edge on a razor blade. First you have to do what a barber does—*hone* it. Allegro both hones and strops double-edge blades. You simply slip the blade into the holder and stroke it a few times on the honing stone, then on the stropping device. It takes but 30 seconds. The blade cuts your beard with new ease, because it has a truly professional edge.

\$6.50 at leading cutlery stores. If not available locally, we send postpaid on receipt of \$6.50.

Graef & Schmidt, Inc., Dept. 57, 381 4th Ave., New York 16, N. Y.

JULY, 1945

Buy War Savings Bonds and Stamps regularly.

**WOODWORKING
IS
FUN**



when you have

GOOD CHISELS

The satisfaction of fine craftsmanship and real recreation will be yours if you equip your postwar home workshop with good Stanley Tools. Among these, none will be handier than an assortment of Stanley Chisels.

The high grade steel and uniform temper throughout the blade of Stanley Chisels has long been famous with craftsmen. The blades hold a keen edge for a long time. Even after years of use, when grinding and honing has greatly reduced blade length, the fine-tempered cutting edge is still good. There will be many types and width of blades and designs of handles to suit your every need.

Let Experts Help Select Your Tools

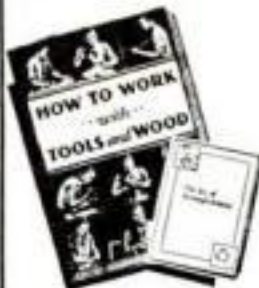
Stanley has a free booklet for you, "The Joy of Accomplishment." Crammed full of helpful suggestions for the hobbyist, it contains: a primary list of tools and a special list of tools to be added as needed. You'll also find the big Stanley textbook: "How to Work with Tools and Wood," mighty useful. It's yours for only \$1.00. Mail the coupon today.



STANLEY

**THE TOOL BOX
OF THE WORLD**

MAIL NOW



**STANLEY TOOLS,
275 Elm St., New Britain, Conn.**

Please send by return mail —

- ☐ The FREE booklet: "The Joy of Accomplishment."
- ☐ 188-page book: "How to Work with Tools and Wood." \$1.00 enclosed.

Name.....

Address.....

City.....State.....

AVAILABLE!

**BURGESS
BATTERIES**
*again
available
for your*
**FLASHLIGHT
RADIO
HEARING AID**



Voted
FIRST
*in a
Nation-wide
poll of*
**ELECTRICAL
EXPERTS**

**BATTERIES
STILL GO TO
WAR—**
Although war
conditions now
permit us to
make batteries
for civilian use,
some are still
going to the
fighting fronts.

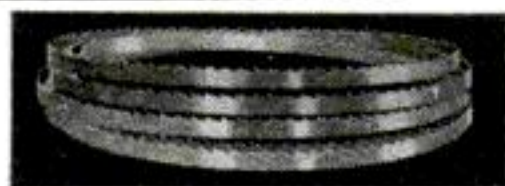
BURGESS BATTERIES

THE COMPLETE LINE FOR EVERY PURPOSE
FLASHLIGHTS • RADIO • HEARING AID
IGNITION • TELEPHONE • INDUSTRIAL
BURGESS BATTERY COMPANY • FREEPORT, ILLINOIS

Electrically Welded Endless

Paramount

BAND SAW BLADES



Made in widths from 1/8" to 1 3/4"

Make your band saw do more work for you. The proper width of blade will extend the scope of this important machine. Burrill's Paramount Blades are made from tough Nickel Alloy Steel properly tempered. Teeth accurately set and filed, and all saws carefully straightened. Send order and check today. Delivery will be made as promptly as war conditions permit, from a few days to a week or two. You can obtain these saws at the following prices:

1/8"-3/16"-1/4"-3/8" wide, 5'6" long.....	\$.90 each
1/8"-3/16"-1/4"-3/8" wide, 6'6" long.....	.95 each
1/8"-3/16"-1/4"-3/8" wide, 7'6" long.....	1.10 each

Other sizes at proportional prices

Your satisfaction is guaranteed

BURRILL SAW & TOOL WORKS
405 E. Main St., Ilion, N.Y.

HULL STYLING...

Modern in appearance and refined in performance, the **HULL STREAMLINE AUTO COMPASS** sets tomorrow's style. Improved in accuracy, easier to compensate. New, shockproof mounting. Folder free. Price \$3.50.



HULL MFG. CO.

P.O. Box 246-E7

Warren, Ohio

WOOD WORKERS

Lumber—Plywood Available

Harold Hunt wants to send you his revised No. 14 Catalog, 124 pages of woodworking ideas, 12 pages of rare woods in color. **UNEQUALED BARGAINS** in imported and American woods, supplies. Send only 10c to cover postage and handling. Those already holding this catalog—send for revised sheets. **CRAFTSMAN WOOD SERVICE CO.**
2728 S. Mary St., Dept. 8-58, Chicago 8, Ill.

only
10¢



Balance 4"x9" Base. With either \$6.00 Metric or Avoirdupois Weights.

Catalog with 3000 illustrations of laboratory Apparatus sent for 75 cents. Catalog listing 10,000 chemicals, drugs, minerals, etc., and 1700 scientific books sent for 25 cents. 100 scientific books, 10 cents.

LABORATORY MATERIALS CO.
7317 Vincennes Ave. Chicago 21, Ill.

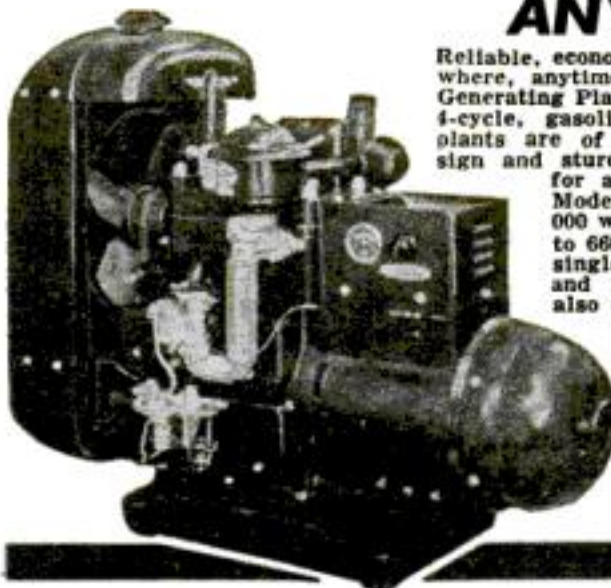


EXTRA VALUE

Genuine Gerstner Tool Chests assure extra service and extra satisfaction. Free catalog for Machinists and Toolmakers.

GERSTNER TOOL CHESTS
545 Columbia St., Dayton 7, Ohio.

ELECTRICITY FOR ANY JOB ANYWHERE



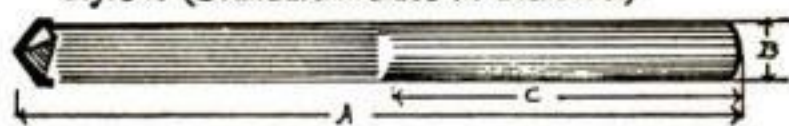
Reliable, economical electric service anywhere, anytime, with an Onan Electric Generating Plant. Driven by Onan built, 4-cycle, gasoline engines, these power plants are of single-unit, compact design and sturdy construction. Suitable for all types of service. Models range from 350 to 35,000 watts. A.C. types from 115 to 660 volts; 50, 60, 180 cycles. single or three-phase; 400, 500 and 800 cycle, single phase; also special frequencies. D.C. types range from 6 to 4000 volts. Dual voltage types available. Write for engineering assistance or literature.
D. W. ONAN & SONS.
1829 Royalston Avenue, Minneapolis 5, Minn.

ONAN

DURAPOINT DRILLS FOR CONCRETE, STONE GLASS, HARDENED STEEL

Style S (Standard in sizes over $\frac{1}{16}$)

Style R (Standard in sizes $\frac{1}{16}$ and under)



PRICE LIST

Diameter	Net Price Each	Over-all Length (A)	Diameter (B)	SHANK Length (C)	Diameter	Net Price Each	Over-all Length (A)	Diameter (B)	SHANK Length (C)
$\frac{1}{8}$ "	\$ 2.75	3"	$\frac{7}{64}$ "	$1\frac{1}{2}$ "	$\frac{5}{8}$ "	\$ 4.50	8"	$\frac{3}{8}$, $\frac{7}{16}$ or $\frac{1}{2}$ "	2"
$\frac{3}{16}$	3.00	$4\frac{1}{2}$ "	$\frac{7}{64}$ "	$1\frac{1}{2}$ "		5.00	6"	$\frac{3}{8}$, $\frac{7}{16}$ or $\frac{1}{2}$ "	2"
	2.75	3"	$\frac{11}{64}$ "	$1\frac{1}{2}$ "	$\frac{11}{16}$	5.25	8"	$\frac{3}{8}$, $\frac{7}{16}$ or $\frac{1}{2}$ "	2"
	3.00	$4\frac{1}{2}$ "	$\frac{11}{64}$ "	$1\frac{1}{2}$ "		5.50	6"	$\frac{7}{16}$, $\frac{1}{2}$ or $\frac{5}{8}$ "	2"
$\frac{1}{4}$	2.75	4"	$\frac{7}{32}$ "	$1\frac{1}{2}$ "	$\frac{3}{4}$	5.75	8"	$\frac{7}{16}$, $\frac{1}{2}$ or $\frac{5}{8}$ "	2"
	3.00	6"	$\frac{7}{32}$ "	$1\frac{1}{2}$ "		6.25	8"	$\frac{1}{2}$, $\frac{5}{8}$ or $\frac{11}{16}$ "	2"
$\frac{5}{16}$	3.00	4"	$\frac{1}{4}$ or $\frac{9}{32}$ "	$1\frac{1}{2}$ "	$\frac{13}{16}$	6.50	10"	$\frac{1}{2}$, $\frac{5}{8}$ or $\frac{11}{16}$ "	2"
	3.25	6"	$\frac{1}{4}$ or $\frac{9}{32}$ "	$1\frac{1}{2}$ "		7.00	8"	$\frac{1}{2}$, $\frac{5}{8}$ or $\frac{3}{4}$ "	2"
$\frac{3}{8}$	3.25	5"	$\frac{1}{4}$ or $\frac{5}{16}$ "	$1\frac{3}{4}$ "	$\frac{7}{8}$ "	7.25	10"	$\frac{1}{2}$, $\frac{5}{8}$ or $\frac{3}{4}$ "	2"
	3.50	7"	$\frac{1}{4}$ or $\frac{5}{16}$ "	$1\frac{3}{4}$ "		7.75	8"	$\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$ or $\frac{13}{16}$ "	2"
$\frac{7}{16}$	3.50	8"	$\frac{1}{4}$, $\frac{5}{16}$ or $\frac{3}{8}$ "	$1\frac{3}{4}$ "	$\frac{15}{16}$	8.00	10"	$\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$ or $\frac{13}{16}$ "	2"
	3.75	6"	$\frac{1}{4}$, $\frac{5}{16}$ or $\frac{3}{8}$ "	$1\frac{3}{4}$ "		9.50	12"	$\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$ or $\frac{13}{16}$ "	2"
$\frac{1}{2}$	4.00	6"	$\frac{1}{4}$, $\frac{5}{16}$, $\frac{3}{8}$ or $\frac{7}{16}$ "	$1\frac{3}{4}$ "	1	11.00	10"	$\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$ or $\frac{7}{8}$ "	2"
	4.25	8"	$\frac{1}{4}$, $\frac{5}{16}$, $\frac{3}{8}$ or $\frac{7}{16}$ "	$1\frac{3}{4}$ "		11.50	12"	$\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$ or $\frac{7}{8}$ "	2"
$\frac{9}{16}$	4.25	6"	$\frac{3}{8}$, $\frac{7}{16}$ or $\frac{1}{2}$ "	2"					

Sizes up to $1\frac{1}{2}$ " obtainable at proportionate cost.

Drills in 64ths and 32nds now in stock, tolerance normally +.005, -.000; tolerance of .001 for 5% extra; tolerance of .001 $\frac{1}{2}$ on special order. Please do not order closer tolerance than you need. Drills below $\frac{1}{8}$ " on special order. All drills from $\frac{1}{8}$ " to 1" not listed made at the price of the size next larger. Specify your largest chuck size.

Durapoint Glass Cutter, like a pencil, better than a wheel cutter for circular cutting. \$2.50, Postpaid.

DURAPOINT TOOL COMPANY, 4342 UMATILLA STREET, DEPT. S, DENVER 11, COLORADO

SHAW and "Peppy-Pal" GARDEN TRACTORS

1 to 9 H.P. Circulars on request. War limits production—We supply repairs for all SHAW Tractors sold in our 41 years in business.

BUILD YOUR OWN RIDING TRACTOR—"WAR HORSE"

using old auto parts, powered by 2 H.P. or larger air-cooled engine; or walking type Garden Tractor $\frac{1}{2}$ to 3 H.P. or convert truck or auto into Farm Tractor. Each with steel or rubber tires; will plow, cultivate. Plans for building, in few hours, any one of above, postpaid for \$1.00 (state which wanted) or all 3 for \$2.00. Money Back Guarantee!

SHAW MFG. CO., 5707 FRONT ST.
Galesburg, Kansas
668PS North 4th St., Columbus, Ohio



STOP THAT DRIP

NO Drip
TAPE



EFFECTIVE IMMEDIATELY

New! A sure cure for condensation drip from cold water pipes. Pliable, cork-filled NoDrip Tape eliminates wet floors, makes idle space usable. Quick, Clean, Easy to Apply—No tools needed. Covers joints as well as straight pipes. At hardware, dept. stores, lumberyards. **\$1.25** Roll, enough for 7 feet of $\frac{1}{2}$ " pipe



Higher west of Rockies and Canada
FREE NODRIP TAPE CIRCULAR
J. W. MORTELL CO.

534 Burch St.

Kankakee, Ill.

The SCHERR MAGNI-RAY—a tool to SEE with!

Invaluable for mechanic, sportsman, stamp collector, gunsmith, etc.

MAGNIFIES the piece under inspection, and FLOODLIGHTS it with rays shielded from user. Widely used in shops, and equally valuable in the home workshop, checking threads, reading small markings on taps and drills, inspecting precision work. Invaluable for gunsmiths checking headspace, sear and

MAKE EXTRA MONEY

as shop agent for the Scherr line of precision tools. Help your shopmates to buy micrometers, sine bars, dial test gages, tool chests, etc. Low prices. Scherr high quality, money-back guarantee. Write for full details.

hammer angles—stamp collectors—sportsmen, tying flies and other fine work—general use, inspecting small photos, removing splinters, etc.

Eyepiece adjustable for height and angle. Heavy base. Lens of genuine optical glass ground by experts avoids all distortion. Three types, A—3" lens, medium magnification, \$16.65. B—2" lens, 3 x, \$24.75. C—5" lens, with handle on eyepiece for use apart from base, \$29.70. Further details on request. Prompt delivery on 10-day money-back basis. Shipped C.O.D., or on receipt of check or money order.



GEO. SCHERR COMPANY, Inc. 200-PS LAFAYETTE STREET
NEW YORK 12, N. Y.

ARE STEAM CARS COMING BACK?



The Modern Steam Car

160 pages, 120 illustrations. Interesting, practical book on steam automobiles. Complete information early and latest makes, models, both U.S. and foreign. Boilers, engines, burners described, illustrated. Articles by Stanley, early steam ads. How to drive and care for steam automobile. Unusual informative book. Postpaid \$2.00 De Luxe Cloth-bound \$3.00.

Steam Car Scrapbook

Compiled by Floyd Clymer. Historical, authentic, amusing. Ads, photos, descriptions 250 early steam cars, with fascinating story by one-time world's youngest auto dealer. Postpaid \$2.00 De Luxe Cloth-bound \$3.00.

Motor Scrapbooks 1 and 2

Acclaimed by nation's foremost book reviewers. "A must", says TIME Magazine. No. 1 and No. 2, each different. Postpaid, \$1.50 each. De Luxe cloth-bound \$2.50 each.

Motor History of America

World's Wonder Book of car history. Newly revised, authentic story of auto industry since its inception. Lists over 1600 makes of gas, steam and electric cars. 50-page historical Scrapbook supplement by Floyd Clymer. Postpaid \$3.00 De Luxe cloth-bound \$4.00.

CLYMER MOTORS, LOS ANGELES 6, CALIF.

MAIL THE COUPON NOW

CLYMER MOTORS, Dept. PS, 2125 W. Pico, Los Angeles 6, Calif.

☐ I enclose \$..... ☐ Send COD the following:

☐ Dime enclosed for America's Most Complete Motor Book Catalog.

NAME.....

ADDRESS.....

CITY..... STATE.....



BUILD YOUR OWN MACHINE TOOLS!

Blueprints \$1.00 - Catalog FREE

Detail construction Blueprints on 6 Lewis metal and wood-working tools postpaid for \$1.00. Includes prints for Lewis 10" Shaper, Milling Machine, Drill Press, Vise, 16" Band Saw, 6" Jointer. Plain or semi-finished castings available for these tools save up to 80% of comparable new tool cost.

Illustrated 22-page Catalog—sent free with Blueprint Order—describes 20 Lewis tools. WRITE TODAY!

LEWIS MACHINE TOOL CO.

P.O. Box 116, Sta. A, DEPT. D-20, LOS ANGELES 31, CALIFORNIA

TELESCOPING MEASURING TOOLS

... Measure All Holes, Slots, Etc.—5/16 inch to 6 inches ... Gives You Outside Micrometer Accuracy on Inside Measurements FINISH YOUR OWN SET OF FOUR TOOLS



Only \$2.95 C.O.D.

Plus Usual Small Postal Charge PART OF THE MACHINE WORK ALREADY DONE—ONLY SIMPLE LATHE WORK NECESSARY TO COMPLETE. No special tools required—Threading, Knurling, etc., already done. Kit includes all material (part machined); simple drawings, and detailed instructions. SEND \$2.95 CASH WITH ORDER AND WE PAY POSTAGE.

ALCO SHOPS, Dept. H, 1459 Sunset Blvd., Los Angeles 26, Calif.

DRILL PRESS OWNERS!

HERE'S 1 TOOL WITH 5 DISTINCT USES



THE BARRON MULTI-PURPOSE ROTARY WOOD PLANER

PLANES & SURFACES • PANELS & BEADS \$750 COMPLETE
ROUTS & GROOVES • RABBETS • TENONS

Converts ANY drill press into a time saving, low cost planer, paneler, tenoner, etc. Surface finishes all types of tough grained and knotty surfaces to agree smoothness. Safe! Guaranteed harmless to drill press. Thousands now in use. SOLD ON MONEY BACK GUARANTEE. Full refund on 5 day trial. Shipped prepaid on receipt of \$7.50—or C.O.D. YOU RISK NOTHING. Free literature.

BARRON TOOL CO., INC.
370 Architects Bldg., Detroit 1, Mich.

ALL METAL AUXILIARY DRILL PRESS TABLE

Has 234 sq. in. true working surface. Equipped for shaper and many other important workshop uses—a real buy at \$785



\$2.00 Price complete at hardware or tool dealers, or send remittance direct to

NORK WIGGLER

for FAST and Accurate Set-Ups

Wiggler body hardened alloy steel. Ball shaft enables you to indicate accurately from tool makers buttons, holes, ground surfaces, gauge blocks, etc. Needle-Point shaft is for finding centers and truing to lay-out lines. Bent shaft holds any type indicator and allows it to be positioned on any circle to 6-inch dia. The only Universal Wiggler of its kind.

NORK PRODUCTS COMPANY
Dept. 236, 5897 S. Main St.
Los Angeles 1, Calif.

LEARN MENTAL TELEPATHY



STEP AHEAD OF THE CROWD!

ROCKET YOUR AMBITIONS into reality. Get things you want; banish Fear, solve problems quickly! Fascinating methods and experiments. Write TODAY for startling FREE booklet and convincing FACTS. Or send \$1 for 5 amazing lessons and GREAT KEY THOUGHT. Atlantean Guild, Box 582-B, Harrisburg, Pa.

NEW IMPROVED MODEL

VERY LITTLE WORK TO FINISH
SAVE A LOT OF MONEY
ORDER YOUR SET TODAY

GET THE IMPROVED

SUPER DRILL GRINDING ATTACHMENT



Sharpens round shank drills from 3/32" to 1-1/16" diameter. Grinds old, broken or dull drills like new in four accurate drill point angles—49°—59°—69°—88°. RECESSED ANGLE GUIDES ELIMINATE NEED FOR PROTRACTOR. Grinds short, medium and long twist drills from 1-1/2" up to 11". Attaches to bench or grinder—equally suited for hand or power-operated grinding wheels. Pays for itself the first week. The Grinding Fixture That Gives Rounded Points!

USED BY ARMY—NAVY—AIRCRAFT PLANTS

40,000 Now in Use! Wherever Drills are Needed!

Don't guess at drill grinding. Anyone can be an expert from the start with the Super Grinder. This precision fixture gives a true center, and clearance desired. Does work like the highest priced grinder. Grinds drills in 25 seconds—Saves drills, time and money. Built for long, hard usage. FOUR ANGLE FEATURE GIVES PROPER POINT TAPERS FOR CLEAN FAST DRILLING IN STEEL, WOOD OR PLASTIC PRODUCTS. No factory, machine shop, home workshop or repair shop should be without the Super Drill Grinder. Delivered with complete instructions. Mail your check or money order for only \$2.95 with your printed address. The Super Grinder will come by return mail—postage paid.

ONLY \$2.95 COMPLETE

CRANDALL MFG. CO.

1512 W. Slauson Ave. Dept. FB-7

Los Angeles 44, Calif.

Guaranteed To Do The Work or Money Refunded

SLIPIT

REG. U.S. & CAN. PAT. OFF.

NEW 5 WAY LUBRICATING FORMULA

Lubricant • Penetrant • De-ruster • Polish • Cutting Oil

FOR THE HOME

Especially compounded to make hard-to-open WINDOWS, DOORS, DRAWERS move unbelievably easy. Retards swelling. Extremely long lasting. Excellent for Oiling and Greasing all HOUSEHOLD APPLIANCES.

FOR THE SHOP

A NEW, POWERFUL, PENETRANT for loosening rusted, corroded machine parts, pipe joints, nuts, bolts. FINE LUBRICANT, EFFECTIVE DE-RUSTER for all tools and instruments. GREAT AID in machining, drilling, tapping, reaming of Aluminum, copper, etc.

FOR THE SPORTSMAN

Now you can give your

GUNS • RODS • REELS • FLIES
the most effective, longest lasting care.

25c 60c 1.20

at hardware, 5-10, Dept. & Sears stores

SLIPIT PRODUCTS INC.

169 Water Street, New York City

Everything in Radio!

Make Radolek your buying headquarters for Radio-Electronic repair and replacement needs. Large stocks assure finest, most complete selections of all available items at lowest prices. Your orders receive special attention for fastest delivery. Send today for FREE Radolek Buying Guide.

RADOLEK CO., Dept. A, 601 W. Randolph St., Chicago 6, Ill.



FREE RADIO BUYING GUIDE

"YANKEE" TOOLS

also make friends

Vast throngs of new shop workers, trained in war industries, have been using "Yankee" Tools for the first time . . . mastering fresh trade skills which will stand them in good stead in the years to come. They have learned what skilled mechanics have long known . . . that "Yankee" Tools complete innumerable tasks *faster, easier, and better.*

"YANKEE" SPIRAL SCREW DRIVER No. 130A
A Size for Every Purpose



"YANKEE" TOOLS

make good mechanics better

North Bros. Mfg. Co., Phila. 33, U.S.A.
Established 1880

Makers, also, of "Yankee-Handyman" Tools

JULY, 1945

Buy War Savings Bonds and Stamps regularly.

Get the SMOOTH-ON REPAIR HABIT



Keep your heating and plumbing systems, household equipment, utensils, tools etc. in repair with Smooth-On No. 1 Iron Repair Cement. You can easily do it yourself—make repairs that last, yet are inexpensive.

Smooth-On is easy to use. You apply it like putty—hardens like metal. Stops leaks. Seals cracks. Tightens loose bolts, rivets, screws, parts, fixtures. Requires no heat, no dismantling of apparatus.

Keep a can of Smooth-On Handy. Does not deteriorate. Ask for it at your regular hardware store in 1 $\frac{3}{4}$ -oz., 7-oz., or larger containers. If you don't find it there write us direct.

THIS REPAIR HANDBOOK **FREE**

Full of easy, short-cut repairs. 40 pages. 170 diagrams. Simple directions. Pocket size. Handily indexed. Absolutely FREE—send the coupon.

—SIGN AND MAIL TODAY—

Smooth-On Mfg. Co., Dept. 58,
570 Communipaw Ave., Jersey City 4, N. J.
Please send the Smooth-on Handbook!

Name.....

Address.....

7-45.....



Do it with **SMOOTH-ON**



Worth Remembering

WHEN YOU CHOOSE YOUR POSTWAR MOTOR

Superb performance does not just happen . . . in war motors or in outboards built for pleasure use. In each it is the product of *know how* achieved through the years. Back of the Evinrudes that sped great fleets of Storm Boats across the Rhine was matchless *know how*. Evinrude's 36 years of *know how* is worth remembering . . . when you select your postwar motor. **EVINRUDE MOTORS**, Milwaukee, Wisconsin.

EVINRUDE

OUTBOARD MOTORS

BUY MORE WAR BONDS . . . AND HOLD THEM!

MADE FROM IMPORTED BRIAR



\$3.50 to \$10



Enjoy unmatched sweet smoking quality, outstanding fine grains, in modern designs, \$3.50 to \$10. At leading tobacconists everywhere. Write for free illustrated booklet.

C. B. WEBER & CO., 146 Cator Ave., Jersey City 5, N. J.

Sand Casting—Forging—Heat Treating—Case Hardening **BRONZE FOUNDRY**



is again available in limited quantity without priority. Orders filled in sequence as received. **INVENTORS-SCHOOLS-CRAFTSMEN** use **FOUNDRYETTE** for making castings quickly for new inventions, for instruction, and general purpose. Order now for early delivery. Three sizes are available capable of making bronze castings of 1½, 3, and 6 pounds weight, aluminum, copper, brass, etc. \$17.50, \$24.00, \$34.50, f.o.b. Kansas City. Domestic gas supply and 110 volt AC or DC energy required for operation. Write for circular.

KANSAS CITY SPECIALTIES CO.
Box 6022, Dept. S-56 Kansas City, Mo.

DANDY 10 PIECE UNIVERSAL TOOL SET

Rigid Pipe Wrench
CHANNELLOCK Pliers
Crestaloy Wrench
Diagonal Cutters
CEETEE Pliers

Ballpein Hammer
Plastic Screwdriver
WATERPUMP Pliers
Rugged Hackaw
Fine Cold Chisel

\$19.85

Price List & Order Blank Free with Order. REMIT Today! If it's Tools—We have it. Can get it, Or it isn't made. • Also Uniform Cap, Shirt and Pants \$9.85 Set.



FROM THE HEART
OF AMERICA



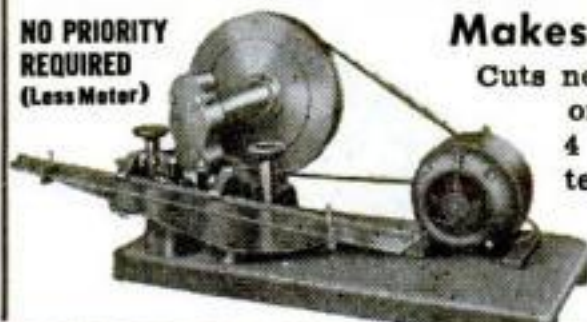
OVERNIGHT BY AIR TO ANYWHERE U. S. A.

UNIVERSAL TOOL CO.

1527 Grand Ave. O. B. Demattels, President Kansas City 8, Missouri

AUTOMATIC RETOOTHING FOR HAND SAWS

NO PRIORITY
REQUIRED
(Less Motor)



Makes New Profits

Cuts new teeth in 50 seconds! Any size tooth 4 to 16 points. Old teeth fall off as chips. Simple to operate. A perfect job.

BURR MFG. CO. 8931 Venice Blvd., Los Angeles 34, Calif.

LAW

STUDY AT HOME for PERSONAL SUCCESS and LARGER EARNINGS. 35 years expert instruction—over 108,000 students enrolled. LL.B. Degree awarded. All texts furnished. Easy payments. Send for FREE BOOK—"Law and Executive Guidance"

AMERICAN EXTENSION SCHOOL OF LAW
Dept. 55-S, 646 N. Michigan Ave., Chicago 11, Ill.

What keeps the pages
nice and neat
And guarantees the
set's complete?



Dennison

GUMMED REINFORCEMENTS
At Stationery Departments Everywhere

Pipe-Tobacco at its best



30c the
pocket-
packet

With that **RICH, NATURAL, NUTTY** Flavor
Write for free booklet, "The Choice
of Experience." John Middleton, 1203
Walnut Tobacco St., Phila. 7, Pa.
Custom-made for the Carriage-trade since 1856

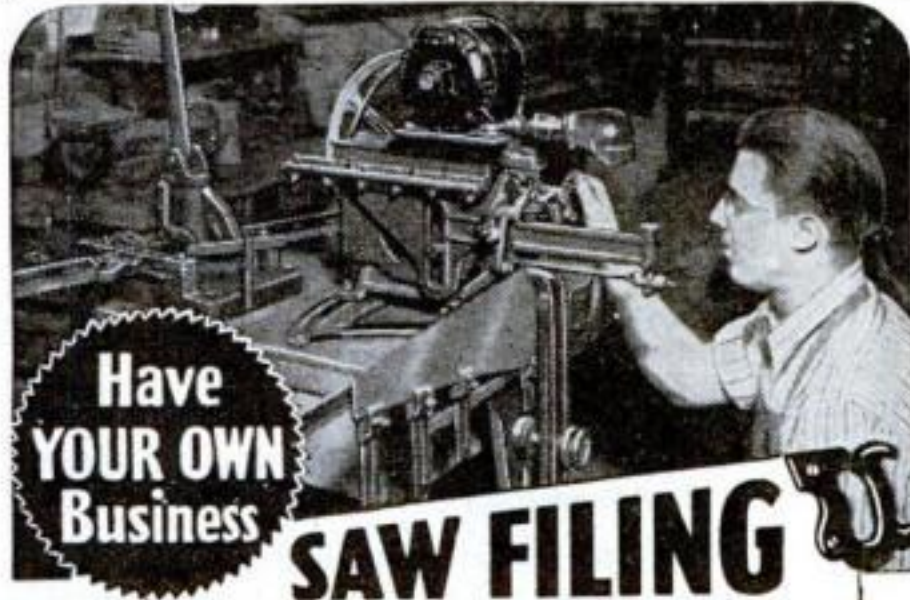
LUCITE

Any thickness. Cut to order. H-94 cement. Custom
fabricating. Sample piece 1/4 inch Lucite, 2x5 inches,
price list, full directions, 35c post paid. Price list
and directions only, 10c, refundable on first order.

MAURICE LANNON

Gem-O'-Lite

Postoffice Box 686, North Hollywood, California.



Have
YOUR OWN
Business

SAW FILING

You can have a good, steady, cash business of
your own reconditioning saws with the Foley
Automatic Saw Filer, which makes old saws
cut like new again. The Foley is the **ONLY**
machine that files all hand saws, also band and
circular saws. Easy to operate—no eyestrain.



SEND FOR FREE PLAN—shows how
to start in spare time—no canvass-
ing. Send coupon today—no sales-
man will call.

FOLEY Automatic SAW FILER

FOLEY MANUFACTURING CO.
719-S Foley Bldg., Minneapolis 13, Minnesota
Send Free Plan on Saw Filing business, no obligation

Name _____

Address _____



How to Cut Any Size Hole with One Tool

Clean, fast cuts from 5/8" to 1 1/2" diameter—in
steel, sheet metal, boiler plate, dural, plastics,
wood, masonite, hard rubber, fibre and other
materials, with

BRUNO Adjustable HOLE CUTTER

Now available for home users,
mechanics, farmers, techni-
cians—all tool users. One
Bruno does the work of
many fixed-radius
cutters. Two tools cut
any hole 5/8" to 2 1/2".
You'll find new uses every day
for Bruno cutters.



Only
\$2.95

Ideal for use in portable drill, hand
brace or drill press. High-speed steel
blade easy to re-sharpen. Ruggedly
built. Designed by cutting tool en-
gineers. **MONEY BACK GUARAN-
TEE.** Bruno No. 100 has 1/4" straight
shank. Also furnished as 100-B, with
bit stock for braces. Cutting range
5/8" to 1 1/2". Either \$2.95. Model No.
101 has 3/8" straight shank (No.
101-B optional, with square bit stock)
and priced at \$4.95. Cutting range
1" to 2 1/2".



Just like a com-
pass, it's easy
to set for any
diameter.



Bruno No. 100 in electric drill
cutting 1 1/2" hole in metal box.



Bruno No. 100-B in hand brace
cutting plastic laminate.

BRUNO TOOLS • BEVERLY HILLS, CALIFORNIA, DEPT. PS-7

SEND THIS COUPON NOW

Bruno Tools • Beverly Hills, California, Department PS-7

Please send me the Bruno Hole Cutters checked below.

Enclosed Find Money Order ☐ Ship C.O.D. ☐
☐ No. 100 \$2.95 ☐ No. 100-B, SQ Shank \$2.95
☐ No. 101 \$4.95 ☐ No. 101-B, SQ Shank \$4.95

Name _____

Street _____

City _____

State _____

California Purchasers add 2 1/2% Sales Tax



Plan Tomorrow's Shop Around a SOUTH BEND LATHE



"Tomorrow" is almost here; that new shop can now be planned. Soon you can see your plans materialize, an up-to-date shop begins to take shape, new tools and equipment are again in sight.

A South Bend Lathe will provide the nucleus for your shop, as a precision lathe is the most useful and versatile of all machine tools. Turning, boring, drilling, reaming, milling, polishing, facing, filing, honing, cutting threads—it's practically a shop in itself. It's the essential all-purpose machine tool around which to plan and build your shop.

Yes, priorities still govern shipments, but "tomorrow" is almost here and it's time to make plans. Write for Catalog No. 9-G, illustrated in color.



"HOW TO RUN A LATHE"

Write for this 128-page handbook on the care and operation of metal working lathes. 365 instructive illustrations. Sent postpaid for 25c U. S. stamps.



Lathe Builders For 38 Years

SOUTH BEND LATHE WORKS
456 EAST MADISON STREET
SOUTH BEND 22, INDIANA

Buy War Savings Bonds and Stamps regularly.

POPULAR SCIENCE

9-INCH LATHE FEATURES

Fine workmanship by highly skilled machine tool craftsmen.

Superfinished spindle with large bearings.

Belt drive for smooth, quiet operation at high spindle speeds.

Back-gear drive for power and low speeds.

Six, eight, twelve, or sixteen spindle speeds.

Thread cutting range, (Model A)—4 to 224 per inch, 48 pitches.

Precision lead screw for thread cutting.

Worm drive and friction clutch for power longitudinal and cross feeds (Models A, B).

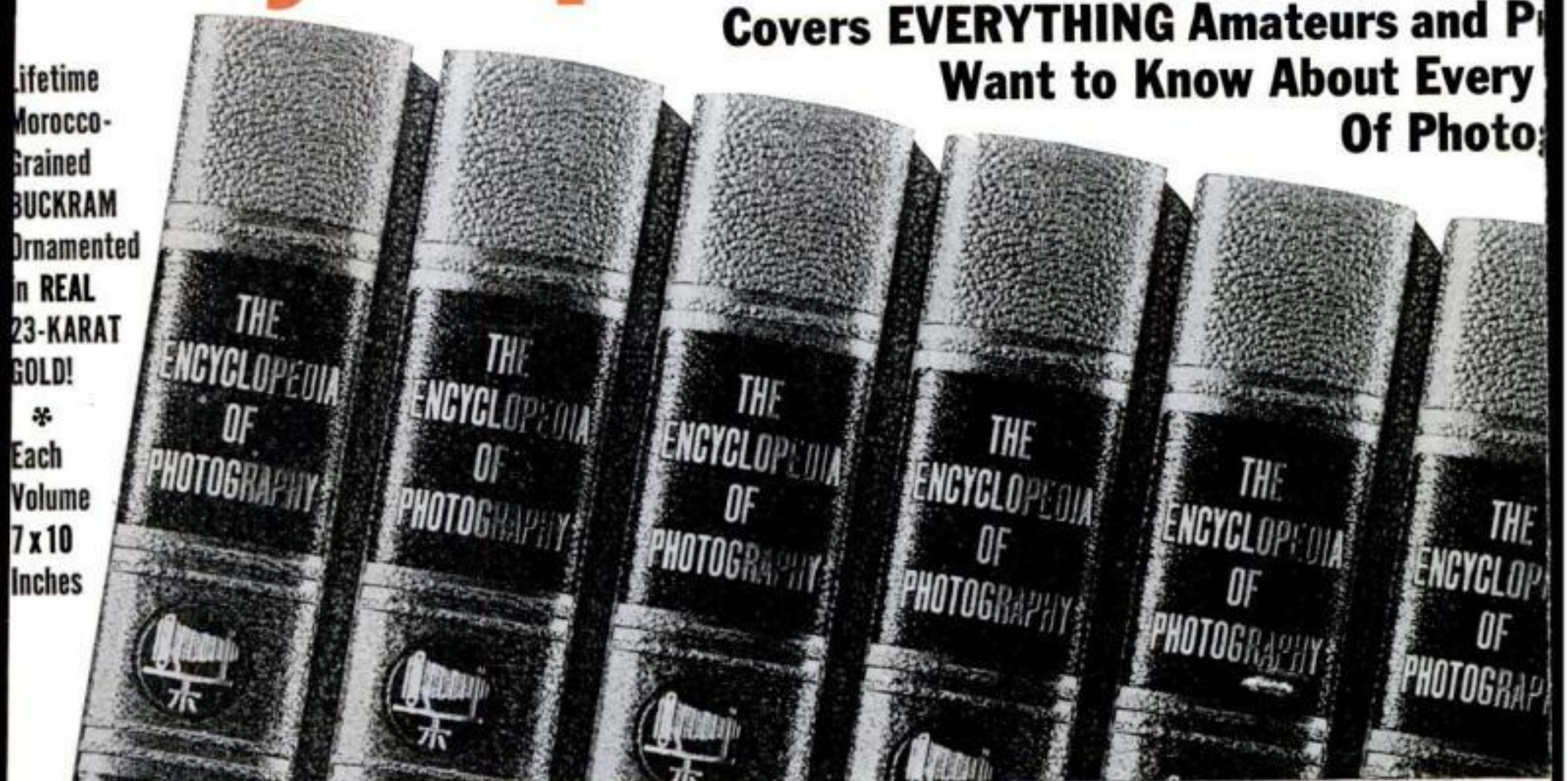
Three hand-scraped V-ways and a flat way on the bed insure perfect alignment of headstock, saddle and tailstock.

LATHE ATTACHMENTS. The versatility of all South Bend Lathes is further broadened through attachments and accessories for many classes of special work.

HERE'S YOUR CHANCE OF A LIFETIME TO OWN THE WORLD'S MOST Encyclopedia of Photo

Covers **EVERYTHING** Amateurs and Professionals
Want to Know About Every
Of Photography

Lifetime
Morocco-
Grained
BUCKRAM
Ornamented
in REAL
23-KARAT
GOLD!
*
Each
Volume
7 x 10
Inches



10 Giant Volumes
2,600,000 Words!

OVER 250 Famous Experts
OVER 4,000 Contributed Over 1900
Big 7"x10" pages of finest coated
perb printing that cannot be duplicated
38-Page Master Index Lists over 9,000 Items!

THESE 10 magnificent volumes comprise the most comprehensive, most up-to-date, most valuable How-to-Do-It Reference Encyclopedia and Self-Instruction Course in Photography ever produced! We have made only a limited edition of this Encyclopedia, using our last remaining supply of the very finest beautiful white coated paper—paper no longer being made under War Production Board orders and now unobtainable at any price! That's why you must act quickly to take advantage of this opportunity.

Greatest Faculty of Experts Ever Assembled!

Think of having at your instant command the help and advice of over 250 leading authorities such as Willard D. Morgan, John O'Reilly, Walt Disney, Paul Outerbridge, Margaret Bourke-White, Ansel Adams, H. R. Rockwell Jr., Gregg Toland, Julien Bryan, Dmitri Kessel; scores of technicians and researchers from Eastman Kodak, Ansco, National Broadcasting, Leitz, Bell and Howell, Zeiss, Bausch and Lomb, General Electric! Here is a veritable Who's Who of the photographic world! They have made every article easy to understand and they represent the last word in authority.

A to Z Arrangement Places Everything at Your Instant Command

This ENCYCLOPEDIA OF PHOTOGRAPHY is complete in every sense of the word. Over 1900 units of instruction cover the use of EVERY kind of camera, accessory and equipment! Still and Action Pictures, Black and White and Color Work, Silent and Sound Movies! The latest and best methods of lighting, exposure, development, printing, enlarging, finishing! Every division of photography such as Portraiture, Candid Camera and Theatre Work, Press Pictures, Advertising Nature and Wild Life, Microfilming, Wirephotos, Police and War Photography, Photo Cartoons etc.! From "A" to "Z" you are taught by the highest ranking expert in each field!

The Most Lavishly Illustrated Work of Its Kind in Existence!

Over 8,400 pictures! 472 FULL-TONE photogravure and FULL COLOR photography! Nearly 1,000 graphic, instructive line drawings! Over 7,000 delicately etched 150-screen black and white half-tones! All presented on the finest quality coated paper on which has been lavished the costliest printing obtainable, to retain ever fine detail of the originals! Such paper is no longer obtainable today for any amount of money! And that's not all! The binding on these volumes is a beautiful Emerald Green Morocco-Grained BUCKRAM—real buckram as used by libraries to make books withstand the hardest kind of use! All ornamentation is in GENUINE 23-KARAT GOLD that remains brilliant throughout the years! A truly De Luxe Library you'll be proud to use for a lifetime!

Whether Photography is your hobby or your career you need this Encyclopedia. It will show you the way to finer results from your work, give you the thrills of new achievements. But our present supply won't last long. Mail the attached card right away to examine this set FREE. If you decide to keep it, pay for it on the easy terms shown on the card; otherwise return without obligation! National Educational Alliance, Inc. 37 West 47 Street, New York 19, N. Y.

Roy Lee Jackson of N. B. C. studios tells you how to take ultra glamorous publicity shots such as this one of Delma Byron.



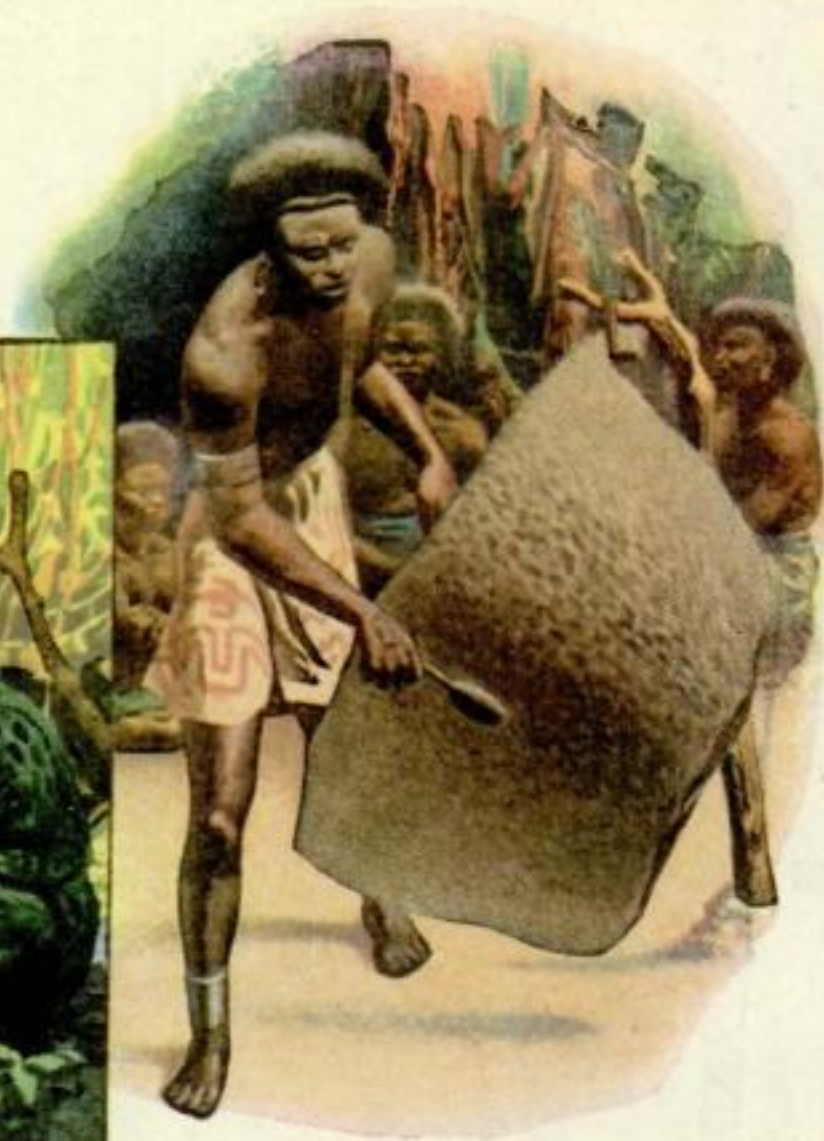
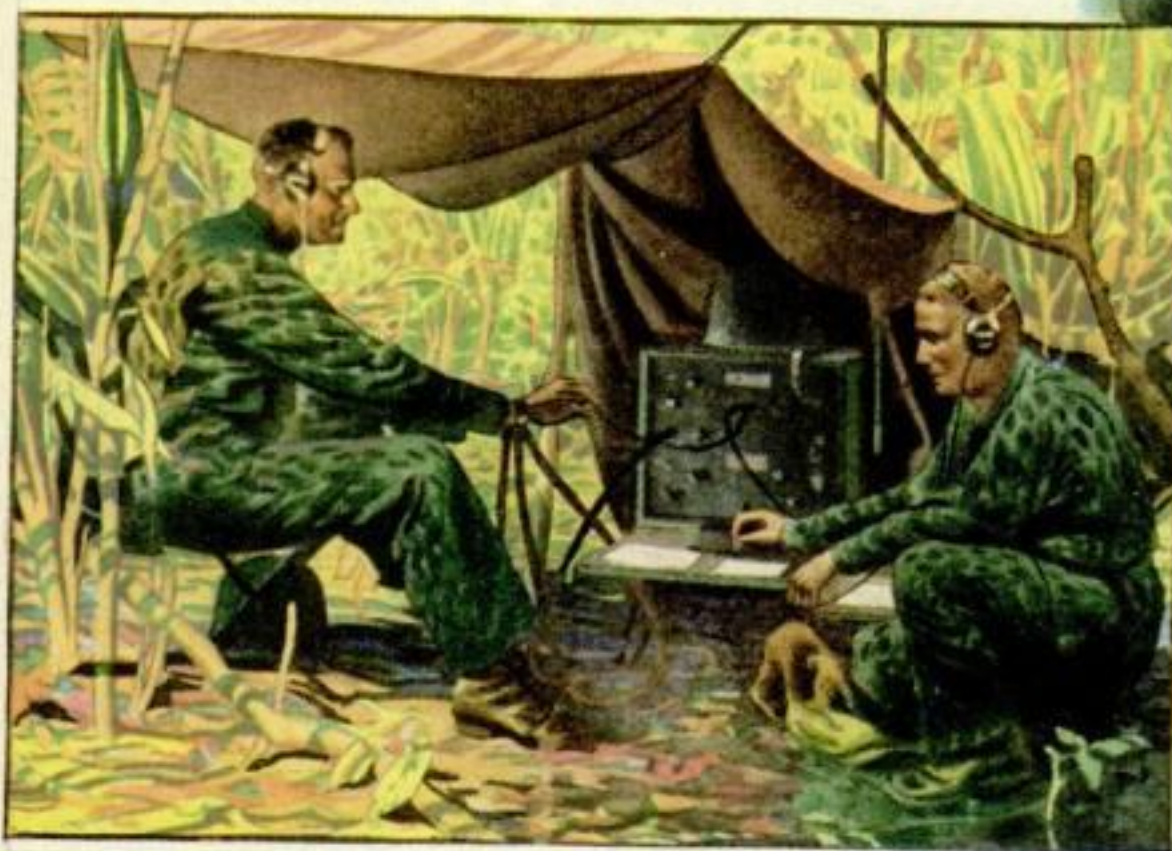
Thousands of Delighted Users: "Worth many times its cost"—B. A., Flint, Michigan. "Without it I should not have come as far . . . today I have established a flourishing photographic business."—N. L., Berwyn, Pa. "Really fine way of getting a real good photographic education."—A. B. B., Des Moines, Iowa. "Recently prints of mine took first, second and popular award. I readily give your books full credit."—F. G. S., Culver City, Cal. "I honestly believe the EVERY photographer, beginner or veteran, should own a set."—W. C. M., Jersey City, N. J. We have files full of UNSOLICITED enthusiastic letters like these!

QUANTITY LIMITED! ACT AT ONCE

Harold Harvey brings you the most thorough how-to-do-it exposition on Development ever presented, based on actual experience.



Fundamentally Different—



—and Far More Dependable!

The New MALLORY TROPICAL DRY BATTERY Overcomes Stiff Handicaps of Heat and Humidity

Military field communications have come a long way since the days of the primitive jungle tom-tom. But extremes of temperature and moisture have been formidable obstacles to dependable performance by the dry cell batteries that power field equipment.

The Signal Corps has long sought a dependable dry battery—one with "shelf life" sufficient to send it into action with full voltage output; one which will have substantially constant voltage throughout its operating life despite jungle heat, dank humidity, icy rains and corrosive fungi. It was a serious problem to provide dependable battery performance under such conditions.

The new Mallory Tropical Dry Battery has done

much to solve the problem. Originally developed by Mallory for the Army Signal Corps, it provides longer operating life, greater power, smaller size.

Mallory Tropical Batteries, as supplied to the Signal Corps, have from four to six times the life of the conventional batteries they have replaced. "Shelf life" is equally outstanding. It withstands high temperatures and humidity which ruin ordinary batteries. What is more, voltage remains substantially constant throughout operating life. The batteries possess the same ampere hours' service-life whether operated intermittently or continuously. In short, the Mallory Tropical Dry Battery assures dependable performance for the military equipment it powers.

Here is dynamic progress in dry cell battery development. Of course, all production now is devoted to Army and Navy needs. But this war-born progress promises much for increased usefulness in peacetime dry battery applications.

P. R. MALLORY & CO. INC.
MALLORY TROPICAL*
DRY BATTERIES

**ALSO MAKERS OF PRECISION METALLURGICAL AND
ELECTRONIC PRODUCTS—AND MALLORY BEARINGS**

*Trade Mark

P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

